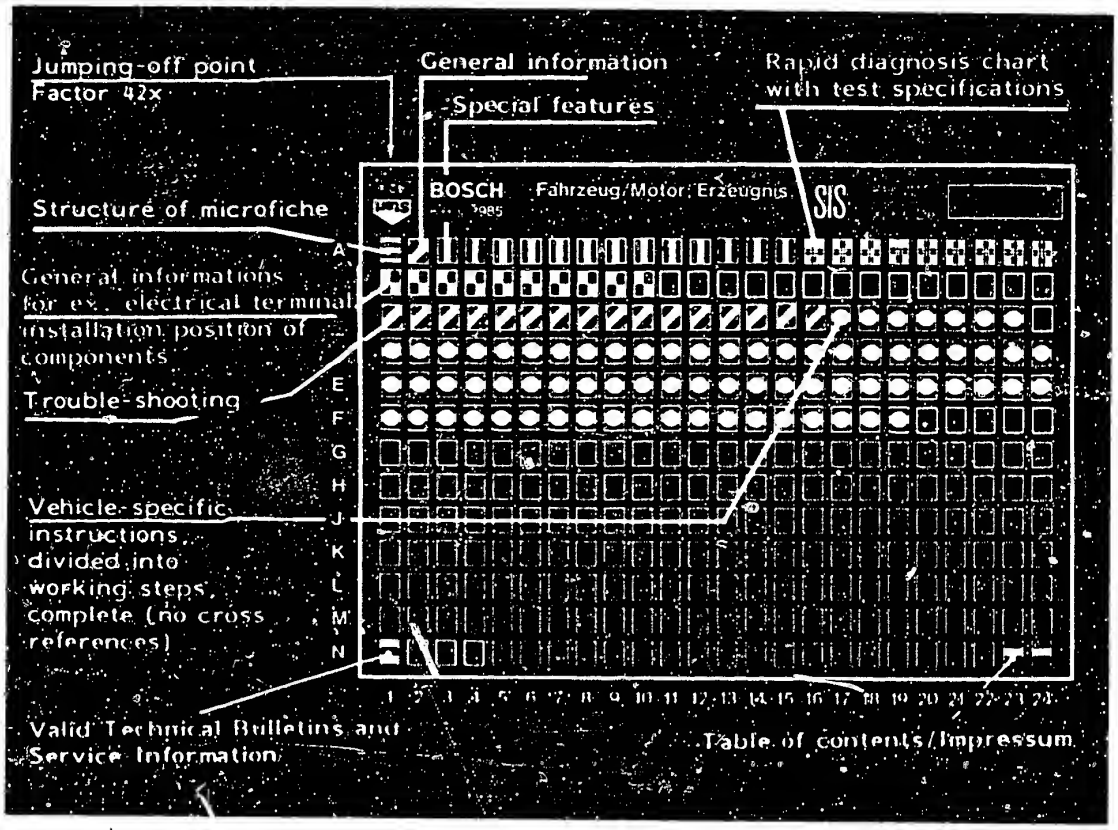
Structure of microfiche



1. Read from left to right
2. Title of microfiche (appears on each coordinate)

E16	Product/component/test step Vehicle/engine

Coordinate

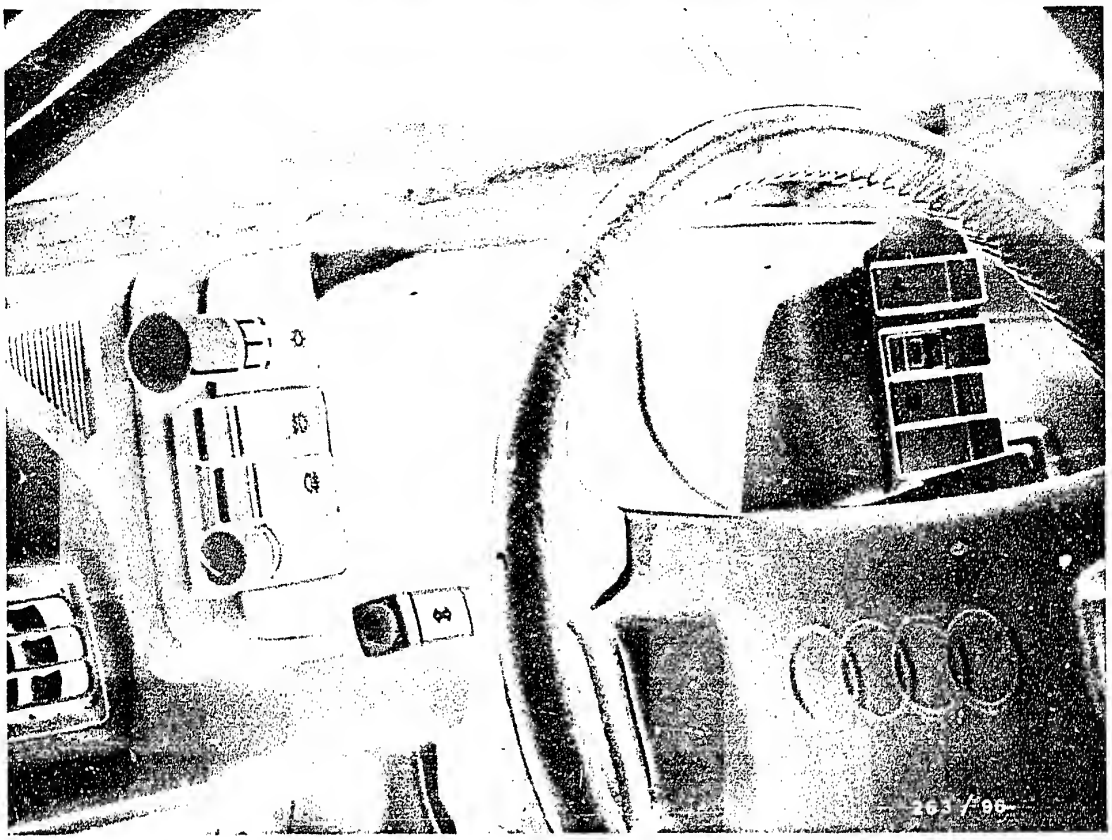
3. Limits of section

Beginning | Mid-section | End | One-page section

4. References to relevant test steps in test specifications; coordinate e.g. C6

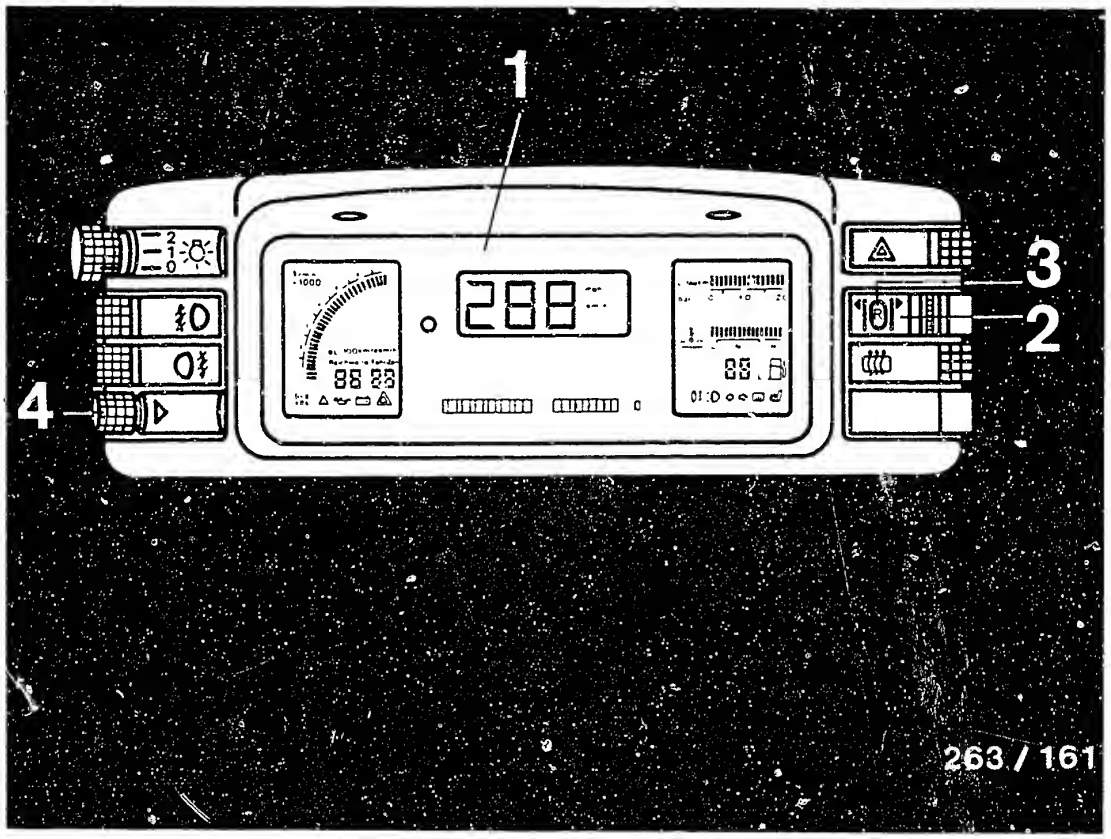
C6

A1	Trouble-shooting program	↓



1. Special features

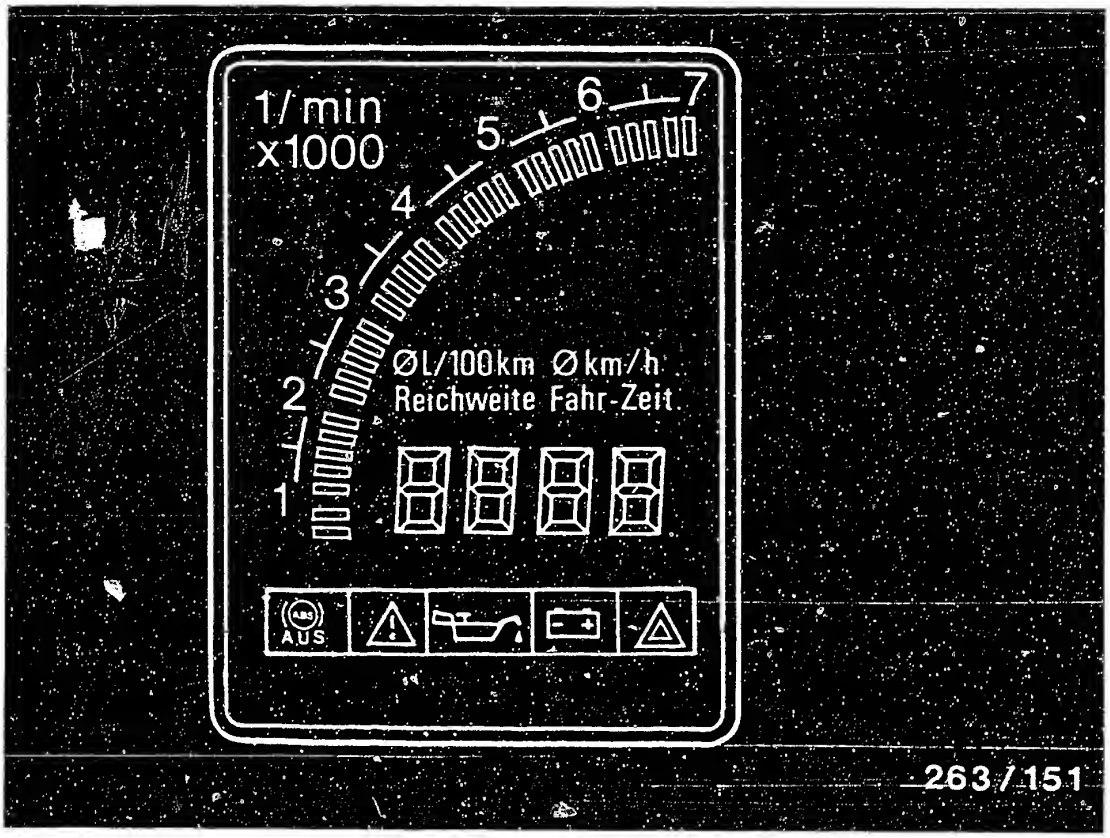
This microcard contains the testing and repair instruc - tions with corresponding test specifications for the fully electronic instrument clusters with integrated trip computer 0 263 220 009, .. 012 (Europe and UK versions).
As of September 1984, these instrument clusters are installed in:
Audi-Quattro
Audi 90 Coupé
Audi Coupé Quattro
Audi 90 Quattro
The tachometer display is selectable between a bar graph display (entire segment field lit) and a pointer display (only 2 segments lit).
On the UK version the speedometer display can be changed from mph to km/h. At the same time, the dimension L is extinguished on the fuel gauge display.



1 = Instrument cluster with VFD display
2 = Rocker button for trip computer functions
3 = Reset switch
4 = Switch for reduced display and display brightness control

2. General introduction

As of September 1984, Bosch is supplying a fully electronic VFD instrument cluster (VFD = Vacuum fluorescence display) with integrated trip computer for Audi vehicles. Operating principle similar to the picture tube of an oscilloscope.



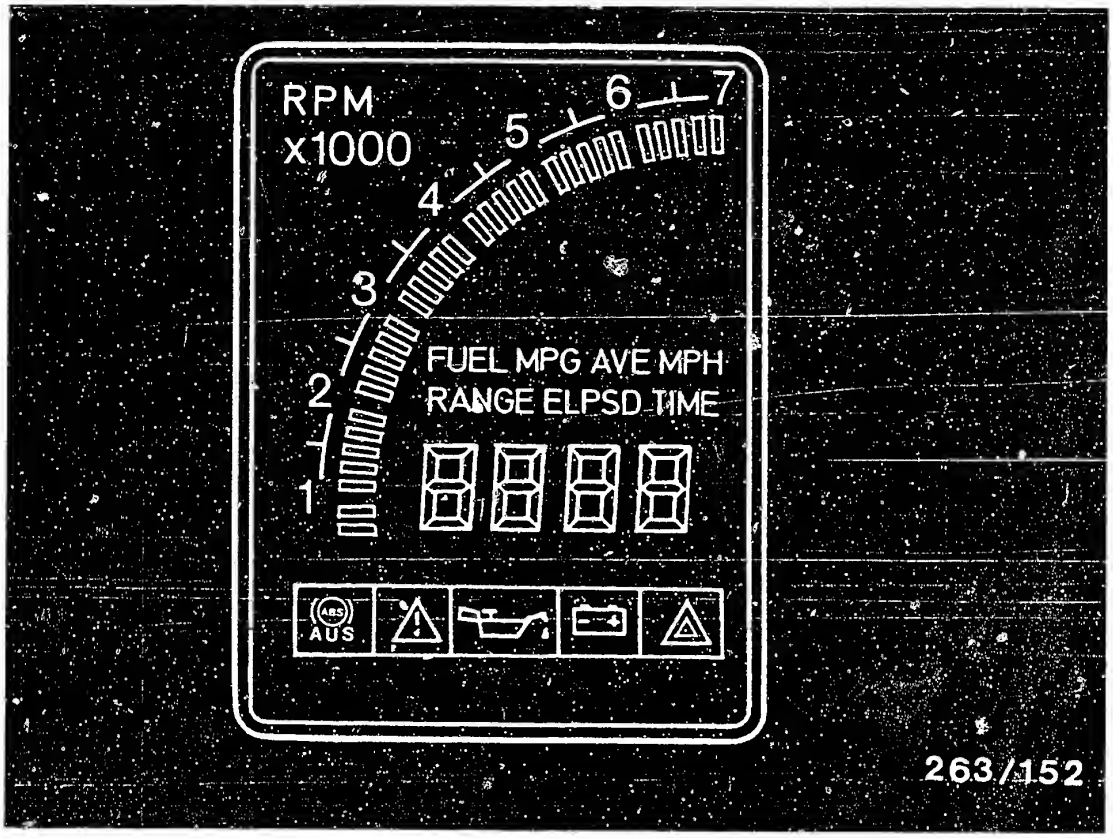
Left-hand display field in instrument cluster
0 263 220 009/010

Tachometer: 2 illuminated segments surround the current engine speed; when the limit speed is reached, the segments up to 6500 min^{-1} begin to flash.

Display may also be in the form of a bar graph (all illuminated segments lit up to the current engine speed).

Trip computer: 6 functions are offered.

Indicator lamps: Conventional (with bulbs).



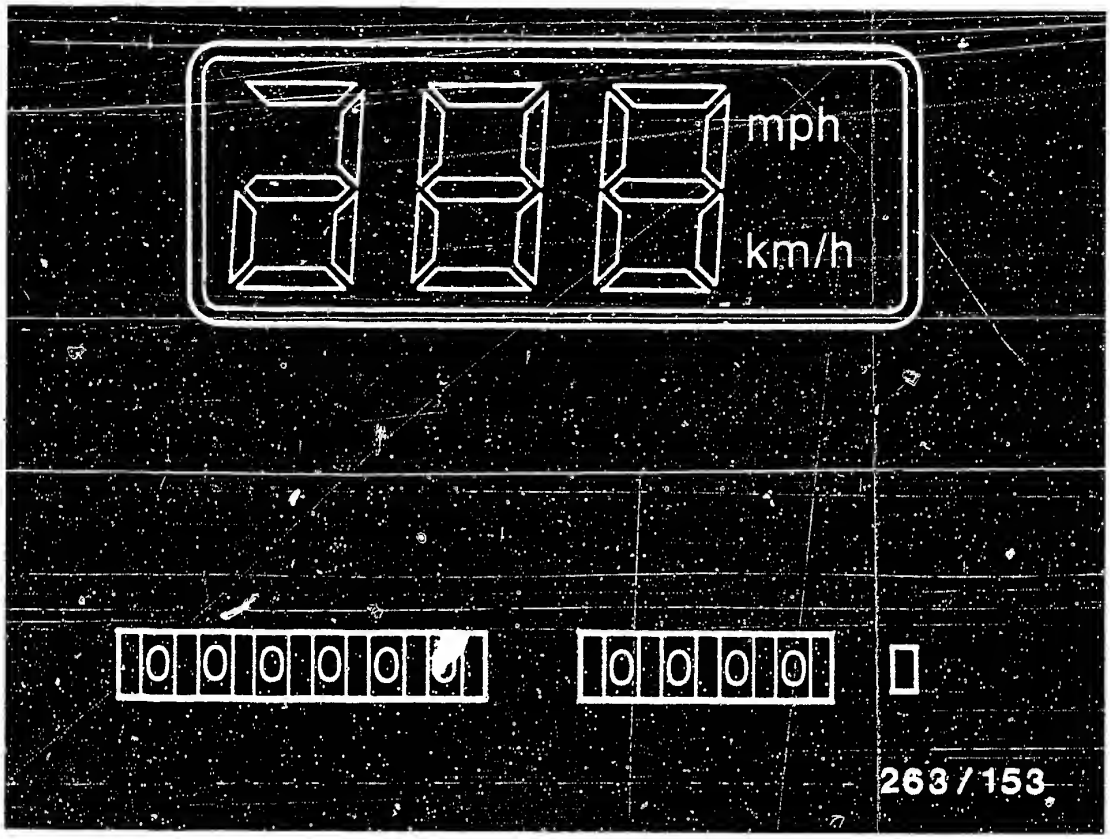
Left-hand display field in instrument cluster
0 263 220 011/012 for UK

Tachometer: 2 illuminated segments surround the current engine speed; when the limit speed is reached, the segments up to 6500 min^{-1} begin to flash.

Display may also be in the form of a bar graph (all illuminated segments lit up to the current engine speed).

Trip computer: 6 functions are offered.

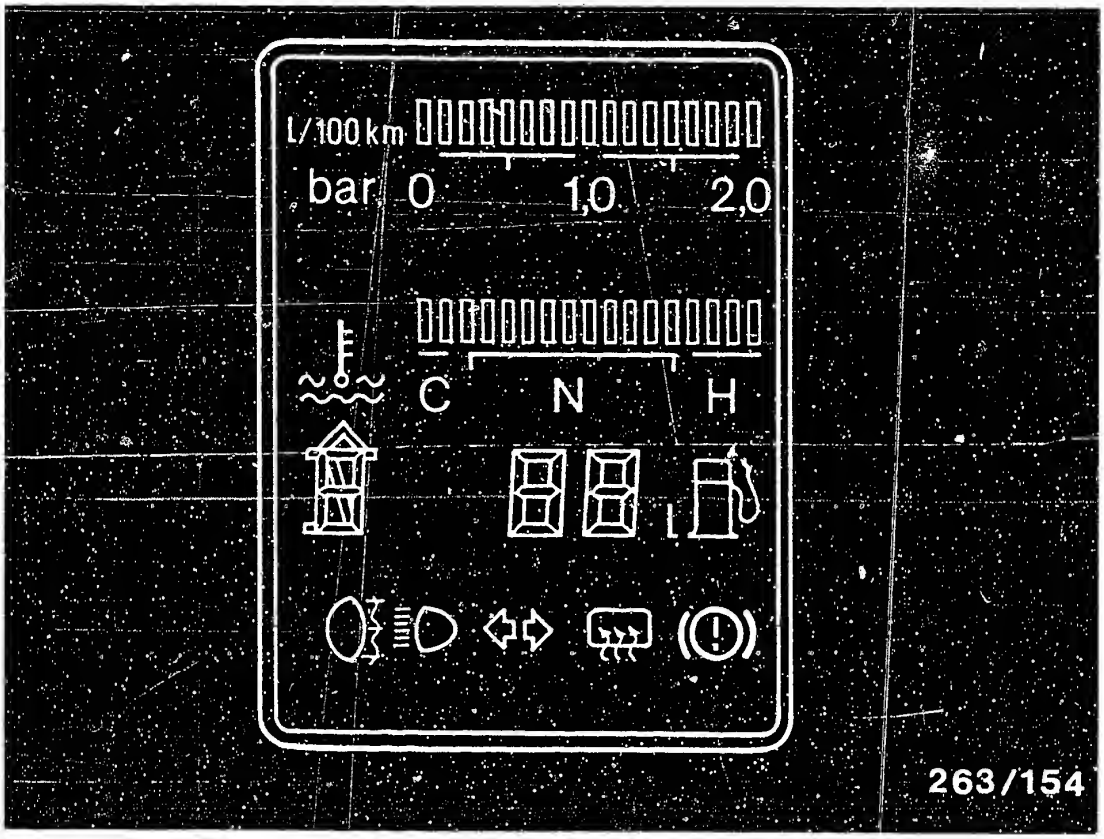
Indicator lamps: Conventional (with bulbs).



Center display field:

	Display	in instrument cluster
Speedometer:	0.5...255 km/h	0 263 220 009/010 (EU)
Speedometer:	3 ...159 mph	0 263 220 011/012 (UK)

Mileometer and trip meter:
Mechanically driven by stepping motor.
Changeover from mph to km is possible on UK version when set to time of day. Select time of day and press reset button for 2 sec.
After start of journey, mph is indicated and vice versa.



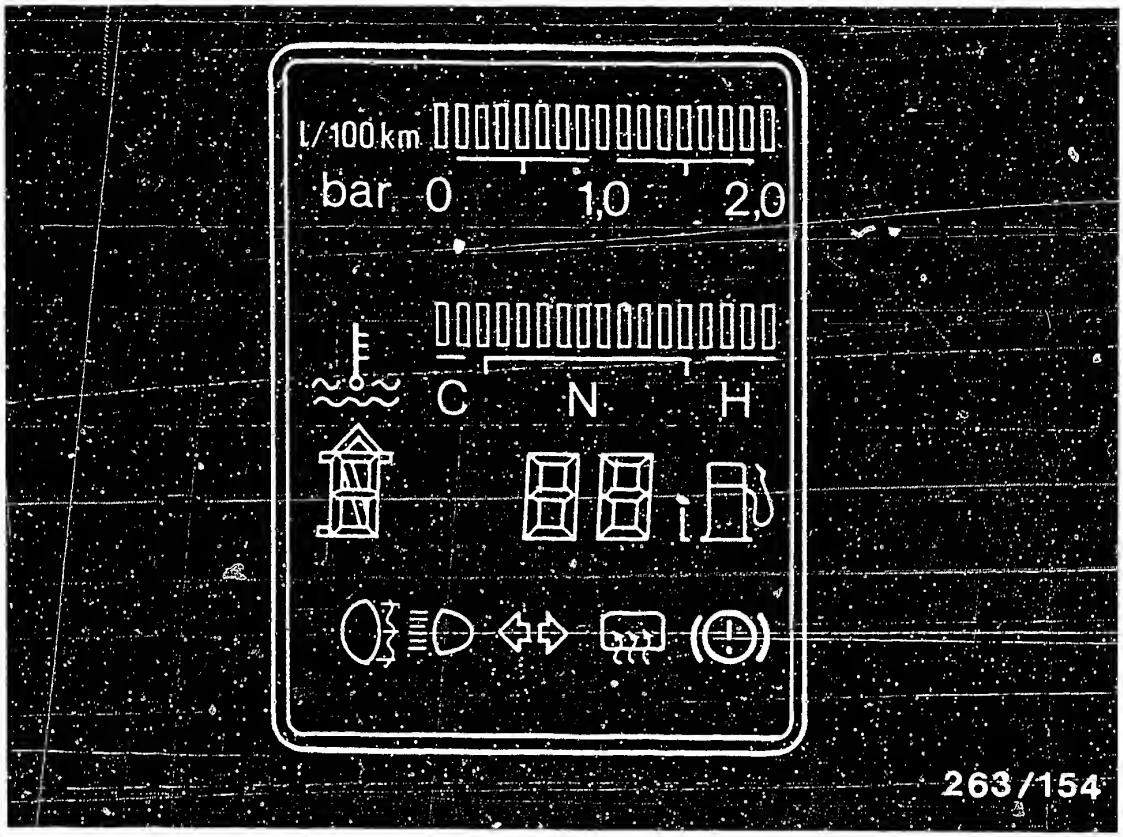
Right-hand display field:

Boost pressure display: (Audi Quattro only) bar graph with 17 segments. The last two segments are electrically connected.

Instead of the boost pressure display, the Audi 90 series has an instantaneous consumption display. Greater than 18.75 l/100 km, the last 3 segments light up.

Coolant temperature:

The two segments of the cold zone (C) light up at a temperature < 50°C. In the normal temperature range (N) the current coolant temperature is indicated by 2 segments which surround the current reading.



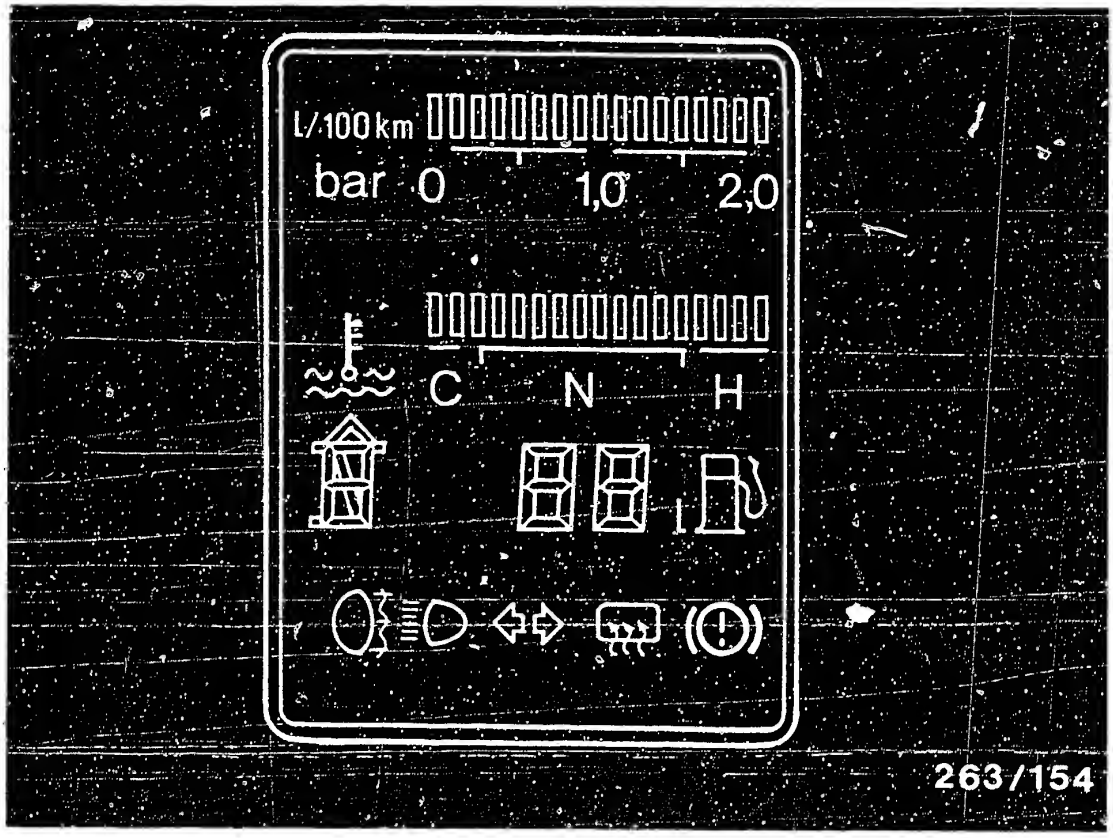
Right-hand display field (continued)

At temperatures > 135°C the four segments of the hot zone (H) flash at a frequency of 1 Hz.

Fuel gauge:

Digital two-digit seven-segment display with gas pump symbol and dimension L.

Display - Europe	5 ... 90 l
Display - UK	1 ... 19 Imp. Gall.



Right-hand display field (continued)

Gas pump symbol flashes on
EU version < 10 l
UK version < 2 Imp. Gall.

On EU version, "L" appears in the right-hand digit at < 5 l.

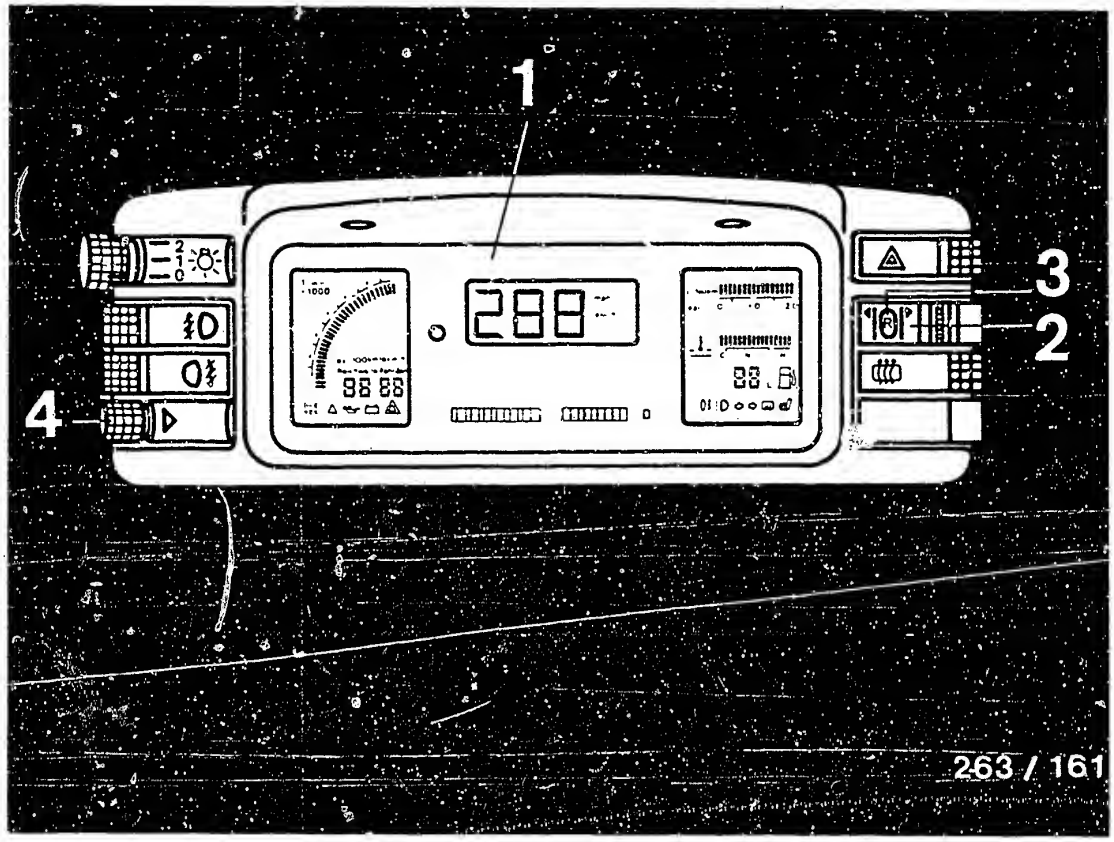
On UK version, no unit of dimension in display; "E" appears only in the right-hand digit.

When the ignition is switched on, all segments are energized for a period of 3 seconds. The digital display of the speedometer and the digital display of the trip computer each show a 2 in the first digit for 1 second and then a 1.

The outer rim of the instrument cluster contains 4 switches on the right, 2 switches on the left, and two rotary knobs. On the right, switch 2 (from top) is used for operating the trip computer.
By operating the rocker button, it is possible to call up the following trip computer functions:

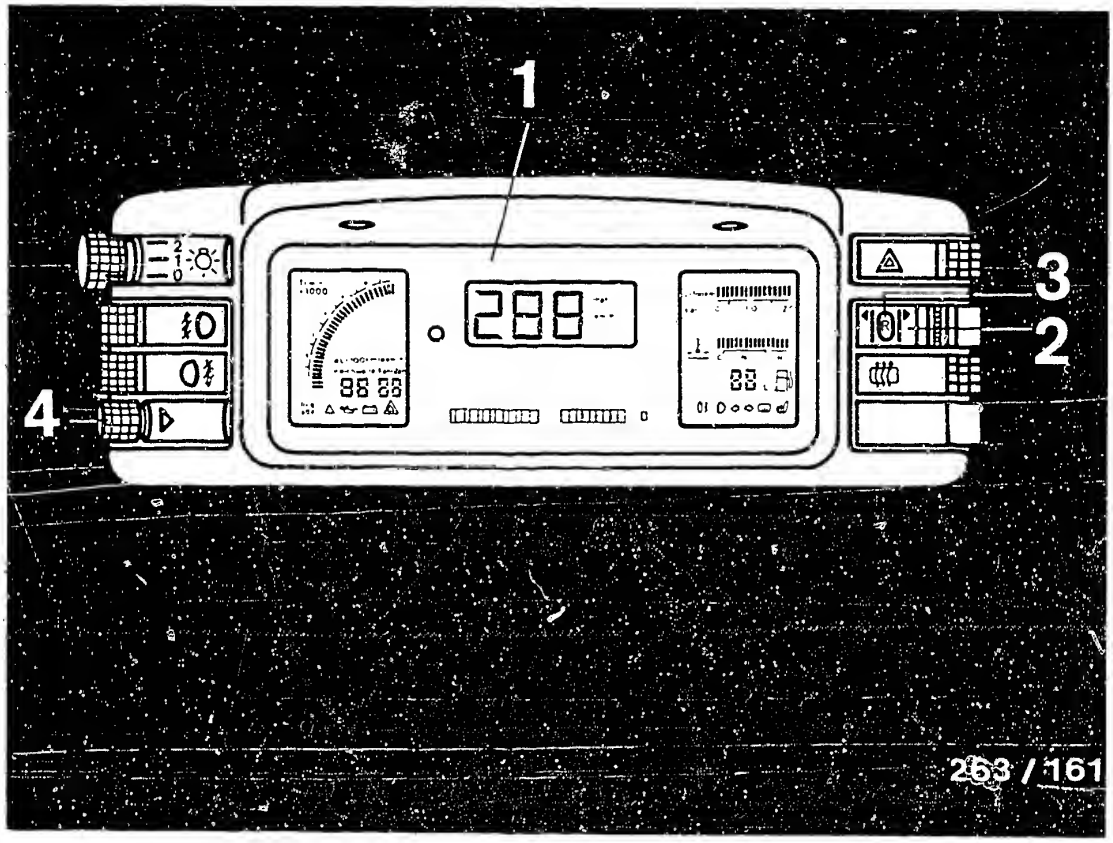
Instrument cluster 0 263 220 ..	009, 010 EU	011, 012 UK
Average fuel consumption	Ø l/100 km	AVE/MPG
Instantaneous fuel consumption	l /100 km	MPG
Average speed	Ø km/h	AVE/MPH
Range (miles to empty)	km	FUEL RANGE
Elapsed time	Fahrzeit	ELPSD TIME
Time (time of day 12 hour mode)	Zeit	TIME
Set TIME (hours*)		
Set TIME (minutes)		

* To select this function, press rocker button on right for at least 3 sec.



With the reset switch (3) - but only with the ignition on - it is possible for the trip computer functions of average consumption/average speed and elapsed time to be reset individually, so that the calculations are started again from the beginning.

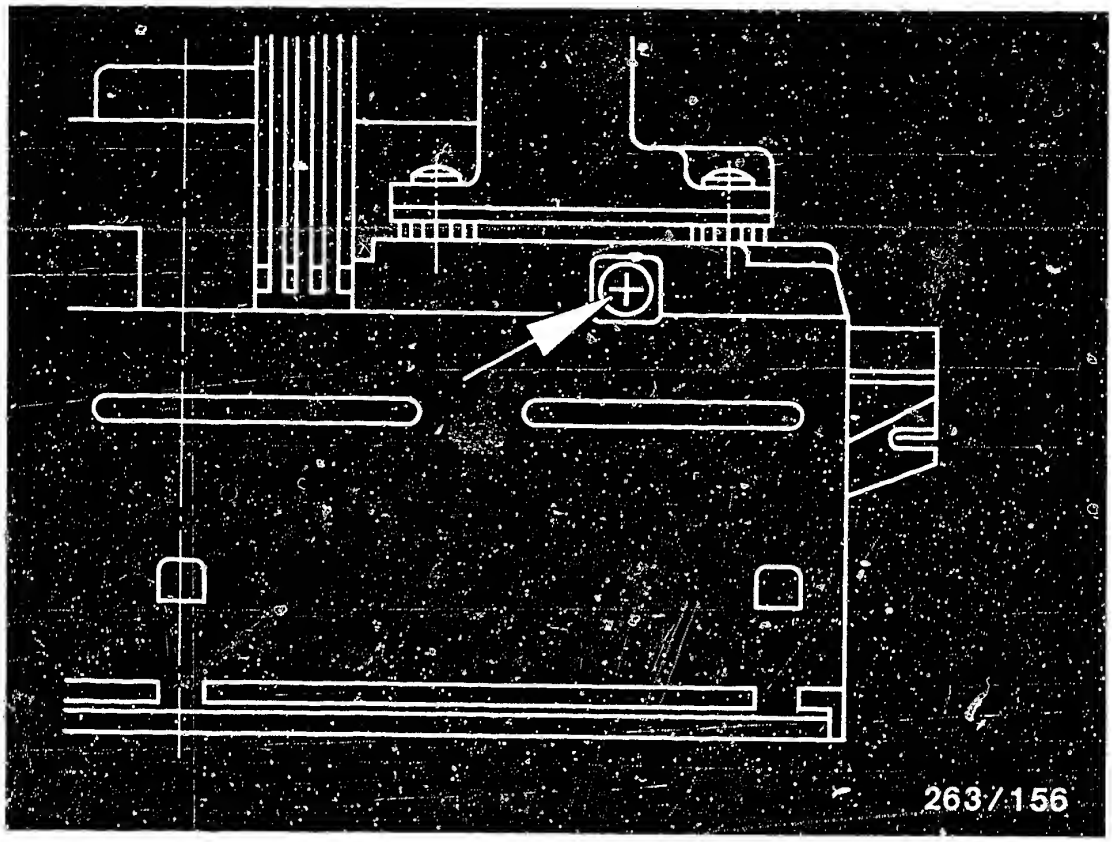
With the ignition off, it is possible to have the time of day indicated by pressing the reset switch (3).



By pressing the reduced-display switch (4) it is possible to reduce the scope of the display such that only the road speed is indicated and the mileometer is lit.

By turning the display brightness control (4), it is possible to vary the brightness of the display.

Warning function:
If a limit value for fuel tank level, water temperature, fuel range or elapsed time is exceeded or fallen below, there is an automatic switch to the full display, and the relevant function flashes (the elapsed time warning is intended to remind the driver after 2 hours driving time that he should take a break).



Encoding of variants

The various vehicle models have different data for revolutions/distance number, tank characteristic, engine.

The vehicle models can be set with a code switch (see picture, arrow).

Setting the code switch

The code can only be called up in "calibrate tank" mode (only in dimension L).

Procedure: Ignition "OFF"
Press reset button, thereby switching on the ignition.

Code switch setting	Code display in field trip comp.	speedo	Vehicle	Engine	Version
1	01	01	Quattro	200 HP	EU
1	E01	01	Quattro	200 HP	UK
2	02	02	Coupé/Audi 90	136 HP	EU
3	03	03	Coupé Q/Audi 90 Q	136 HP	EU
4	04	03	Audi 90 Q 160 HP	160 HP	EU

Return to normal operation by starting the engine or by switching the instrument cluster off and on.

The Audi Quattro has a check system with voice synthesizer

This check system is for monitoring important vehicle functions. Malfunctions are indicated visually and audibly.

Prior to each voiced announcement the check system warning lamp lights up.

The malfunction is announced through the left-hand loudspeakers of the car radio. The language is stored in electronic modules (synthetic language, i.e. not from tape, not from record) and switches on in the case of a malfunction.

Further details are contained in the owner's manual.

3. Rapid diagnosis chart

The following rapid diagnosis chart makes it possible for the experienced expert to quickly check the instrument cluster and the associated sensors/sensor signals using normal workshop test equipment.
To do this, the universal test adapter is connected between instrument cluster and vehicle wiring harness using the system adapter lead.

This chart contains the following information:

- Sequence of test steps
- Switch/switch position on universal test adapter
- Test instructions and test specifications
- Reference to coordinates of the respective detailed testing and trouble-shooting program.
  If detailed information and instructions are necessary, always proceed in accordance with the trouble-shooting program starting on Coordinate B1.

Before testing, make sure of the following:

- Check the customer complaint. (Check operation of instrument cluster in accordance with owner's manual).
- Electrical system (fuses, battery voltage) O.K.

Rapid diagnosis chart

Test step	Switch setting V	Switch setting Ω	Explanatory notes on testing (all measurements to ground)	Terminal on 35-pin plug of instrument cluster	Test specifications	Coordinates
1	↓	1	Ground test - vehicle ground to 35-pin plug of vehicle wiring harnes	14	approx. 0 ... 10 Ω	C 18
2	↓	6	Ground test - vehicle ground to instrument cluster	18 →14	approx. 0 ... 10 Ω	C 20
3	↓	7	Coolant temperature sensor R_{20} = Resistance at + 20°C R_{40} = Resistance at + 40°C R_{60} = Resistance at + 60°C R_{90} = Resistance at + 90°C R_{120} = Resistance at +120°C	35 → 14	* R_{20} = approx. 1 kΩ R_{40} = approx. 500 Ω R_{60} = approx. 250 Ω R_{90} = approx. 100 Ω R_{120}= approx. 50 Ω	C 22
4	↓	8	Tank sender R_{empty} = Resistance with tank empty R_{full} = Resistance with tank full	1 → 14	R_{empty} approx.300 Ω * R_{full} approx. 30 Ω	D 1
5	↓	11	Fuel consumption sensor ground connection	5 → 14	approx. 0 ... 10 Ω	D 3
6	↓	12	Fuel consumption sensor, resistance	19 → 5	3000 ... 5000 Ω *	D 5

* Plug disconnected from instrument cluster

Rapid diagnosis chart (continued)

Test step	Switch setting V	Switch setting Ω	Explanatory notes on testing (all measurements to ground)	Terminal on 35-pin plug of instrument cluster	Test specifications	Coordinates
7	↓	13	Fuel consumption sensor, resistance	34 → 5	500 ... 900 Ω	D 7
8	↓	20	120° thermo-switch Short-circuit Ω sockets on UNi-adapter	11 → 14	Display on cluster temp. flashes	D 9
9	↓	21	Overrun cutoff Short-circuit Ω sockets on UNi-adapter	25 → 14	Display on cluster instantaneous consumption = ave.	D 11
10	1	-	Battery voltage term. 30 on instrument cluster	12 → 14	approx. 12 V	D 13
11	2	-	Battery voltage term. 30 on instrument cluster	29 → 14	approx. 12 V	D 15
12	3	-	Voltage from term. 15, ignition ON	21 → 14	approx. 12 V	D 17
13	4	-	Voltage from term. X, ignition ON	8,9 → 14	approx. 12 V	D 19
14	7	-	Start engine (engine-speed pulses at term. 7 of ignition trigger box at idle)	31 → 14	approx. 0.7 V	D 21
15	8	-	Oil-pressure switch for 0.35 bar opens as of approx. 0.3 bar. Voltage rises from 0 V to approx. 12 V. Engine idling	3 → 14	approx. 12 V	D 23
16	9	-	Boost pressure sensor, ignition ON Voltage with engine off and atmospheric pressure approx. 1 bar. Voltage at idle speed	16 → 14	1.3 ... 2.1 V approx. 0.35 V	E 1

Rapid diagnosis chart (continued)

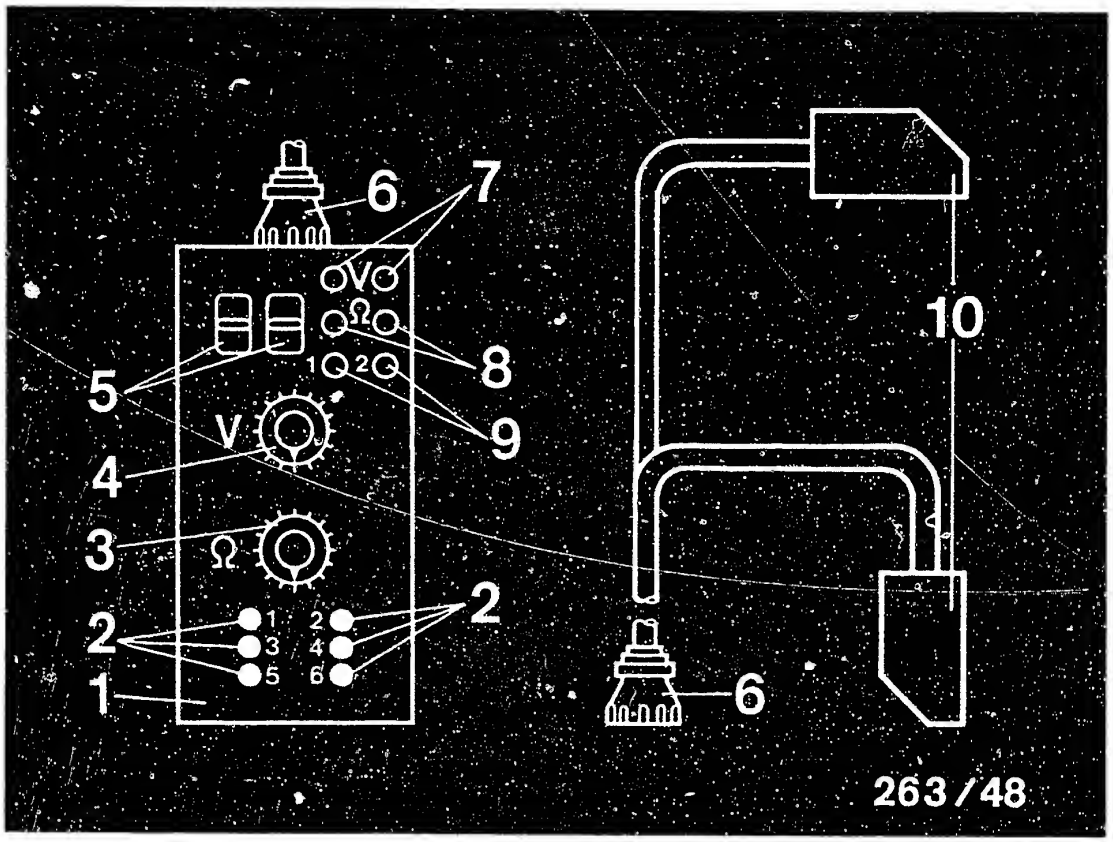
Test step	Switch setting V	Switch setting Ω	Explanatory notes on testing (all measurements to ground)	Terminal on 35-pin plug of instrument cluster	Test specifications	Coordinates
17	10	-	Distance pulse generator (supplies square-wave voltage). Ignition ON and move vehicle approx. 1 m.	30 → 14	0 - approx. 5V-0V or approx. 5V-0-approx. 5V	E 3
18	11	-	Terminal 61 - generator voltage D + 1. Start engine, raise idle speed 2. Engine off	20 → 14	≧ 12 V 0 V	E 5
19	12	-	Fuel consumption sensor supply voltage Ignition ON	19 → 14	approx. 5 V	E 7
20	13	-	Fuel consumption sensor measured value (depending on current position of consumption sensor) Ignition ON	34 → 14	0 - 4.5 V	E 9
21	14	-	Rocker switch for trip computer - press rocker on left Ignition ON	33 → 14	approx. 5 V → 0 V	E 11
22	15	-	Rocker switch for trip computer - press rocker on right Ignition ON	15 → 14	approx. 5 V → 0 V	E 13
23	16	-	Press reset switch Ignition ON	13 → 14	12 V → 0 V	E 15

Rapid diagnosis chart (continued)

Test step	Switch setting V	Switch setting Ω	Explanatory notes on testing (all measurements to ground)	Terminal on 35-pin plug of instrument cluster	Test specifications	Coordinates
24	17	-	Press reduced-display button (min, max) Ignition ON	32 → 14	0 V → approx. 12 V	E 17
25	18	-	Switch on rear fog warning lamp (indicator lamp for rear fog warning lamp). Ignition ON, driving lights ON	24 → 14	approx. 12 V	E 19
26	19	-	Switch on hazard-warning system (indicator lamp for hazard-warning system) Voltage pulse in rhythm of flashing frequency	6 → 14	approx. 6 V	E 21
27	20	-	Switch on heated rear window (indicator lamp for heated rear window). Ignition ON	22 → 14	approx. 12 V	E 23
28	21	-	Terminal 56a upper beam (indicator lamp for upper beam) Ignition ON, driving lights ON	7 → 14	approx. 12 V	F 1
29	22	-	Terminal 49a (indicator lamp for turn signal). Operate turn signal. Ignition ON Voltage in rhythm of flashing frequency	23 → 14	0 - approx. 12 V	F 3
30	23	-	Operate brightness control for instrument cluster Driving lights ON, ignition ON	26 → 14	approx. 6 - 12 V	F 5

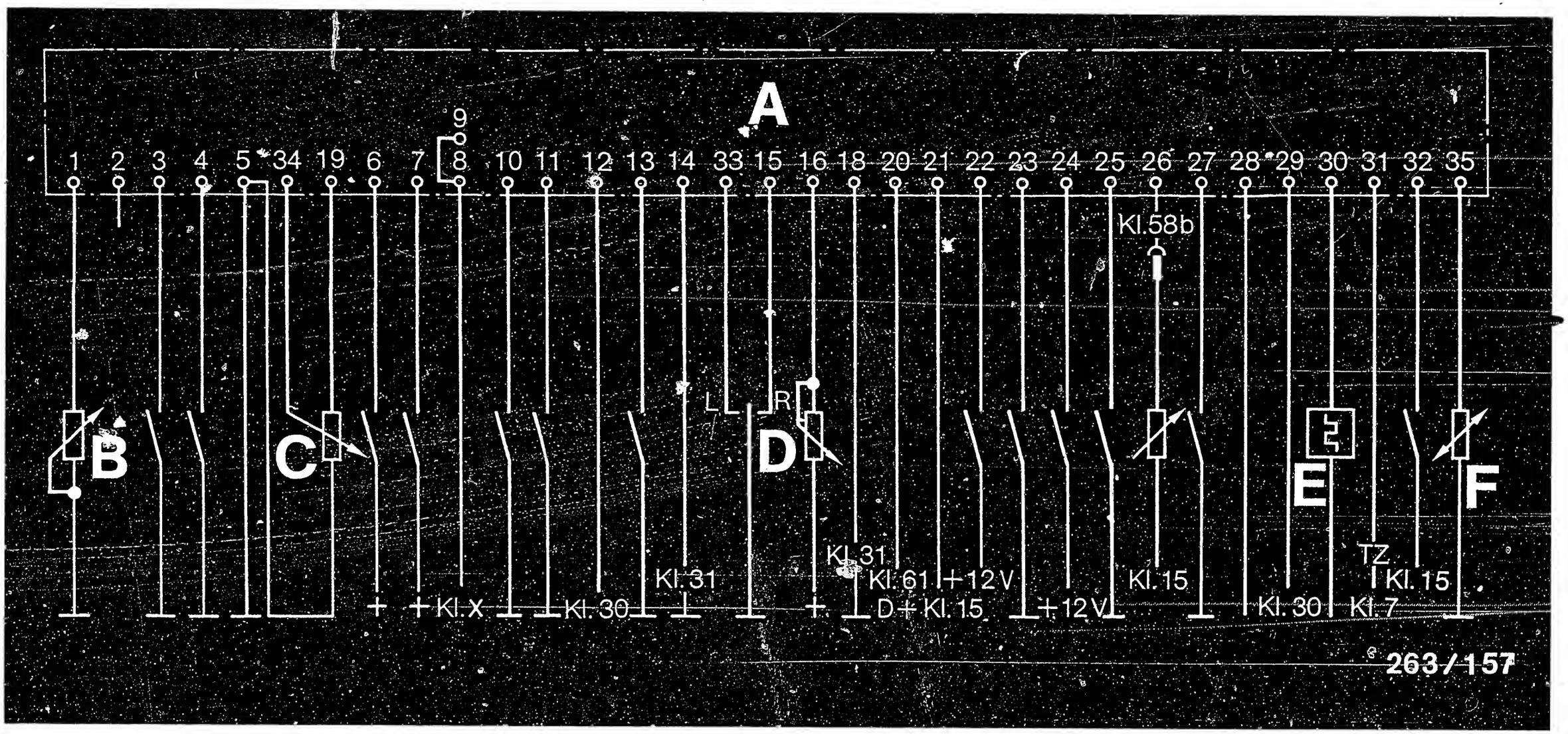
4. Test equipment

Universal test adapter	0 684 101 801
Adapter lead	KDES 0011
Multimeter Ri $\geq$ 20 kΩ	Commercially available



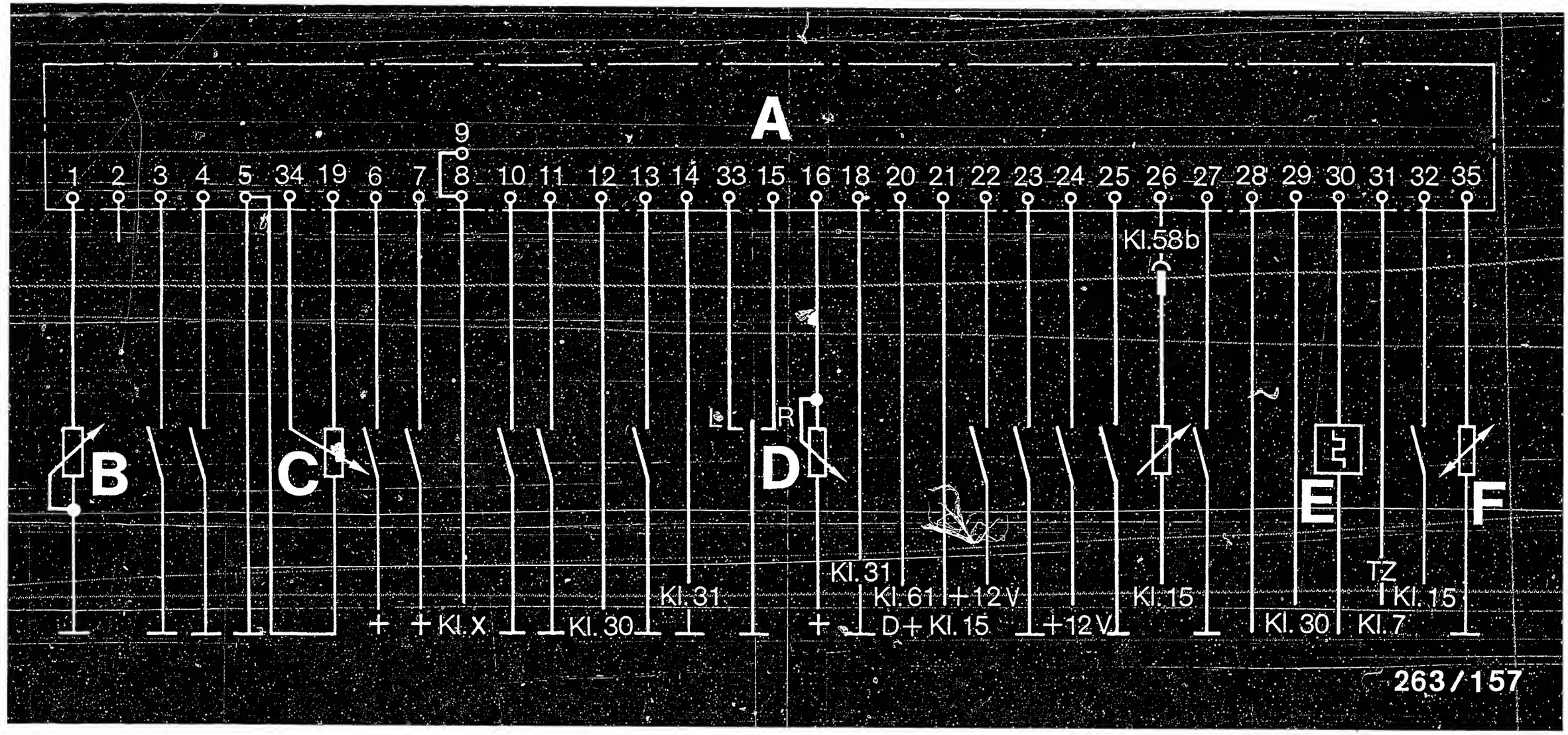
1 = Universal test adapter 0 684 101 801
2 = Simulation button panel
3 = Program switch for resistance measurements
4 = Program switch for voltage measurements
5 = Test well for special input of motortester
6 = 63-pin plug connector for adapter lead KDES 0011
7 = Test sockets for voltage measurement
8 = Test sockets for resistance measurement
9 = Sockets for special functions (socket 1 to pin 8, socket 2 to pin 26 of instrument cluster: power supply when instrument cluster removed - e.g. working at test place)
10= Adapter lead KDES 0011 with 35-pin plug and connector

4.1 Universal test adapter with adapter lead KDES 0011



5. Terminal diagram (terminal assignment) of instrument cluster

A = Instrument cluster
B = Tank sender
C = Consumption sensor
D = Boost pressure sensor
E = Distance sensor
F = Coolant temperature sensor
1 = Tank sender
2 = Calibration output for fuel consumption sensor
3 = Oil pressure switch 0.3 bar
4 = Switch for "warning" indicator lamp
5, 34, 19 = Connection for fuel consumer
6 = Switch for hazard-warning indicator
7 = Switch for upper beam indicator
8,9 = Term. X
10 = ABS/OFF
11 = Thermo-switch 120°
12 = Term. 30
13 = Reset switch for trip computer
14 = Term. 31
15 = Rocker switch, right-hand, for trip computer

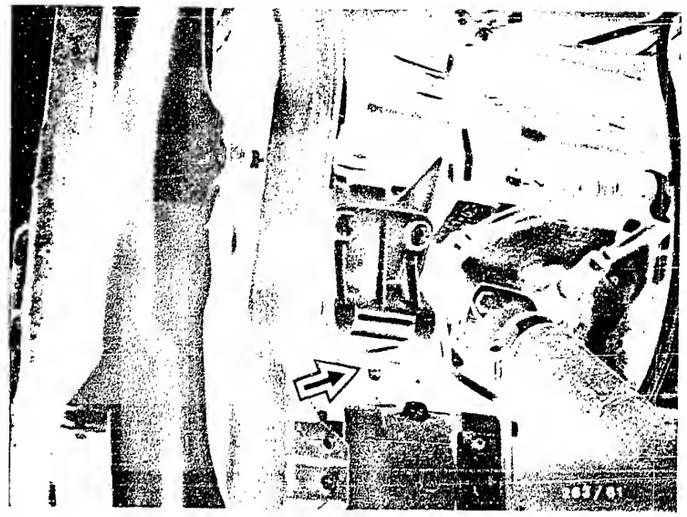


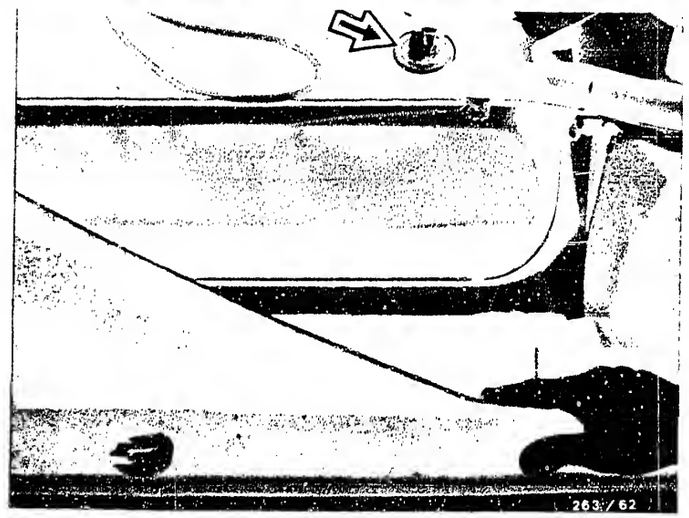
Terminal diagram (terminal assignment) of instrument cluster (continued)

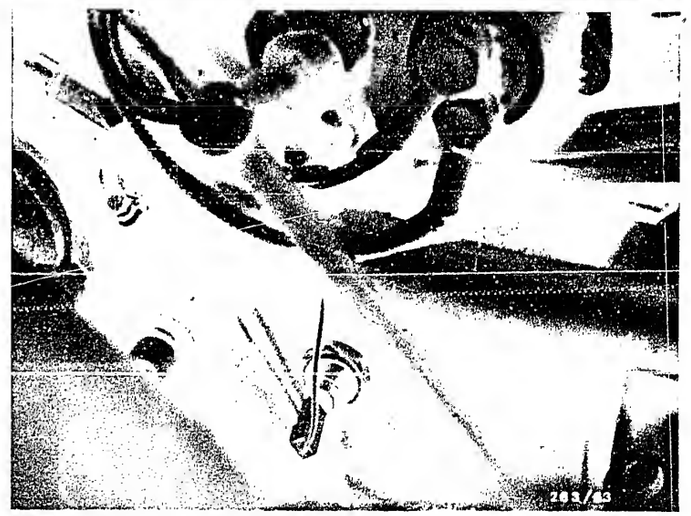
16 = Boost pressure sensor
18 = Term. 31
20 = Term. 61
21 = Term. 15
22 = Heated rear window
23 = Switch for turn-signal indicator
24 = Fog lamp indicator
25 = Overrun cutoff
26 = Brightness control K 58 b
27 = Brakes
28 = Tank alarm for speech synthesizer
29 = Term. 30
30 = Distance sensor
31 = Engine-speed signal from transistorized ignition
32 = Reduced-display button
33 = Rocker switch, left-hand, for trip computer
35 = Temperature sensor

6. Installation position of components

Electronic instrument cluster	:	In place of conventional instrument cluster behind steering wheel (not shown)
Coolant temperature sensor	:	On engine block (see arrow, top picture)
Tank sender	:	In luggage compartment (see arrow, center picture)
Oil pressure switch	:	Next to oil dipstick (see bottom picture)







Installation position of components (continued)

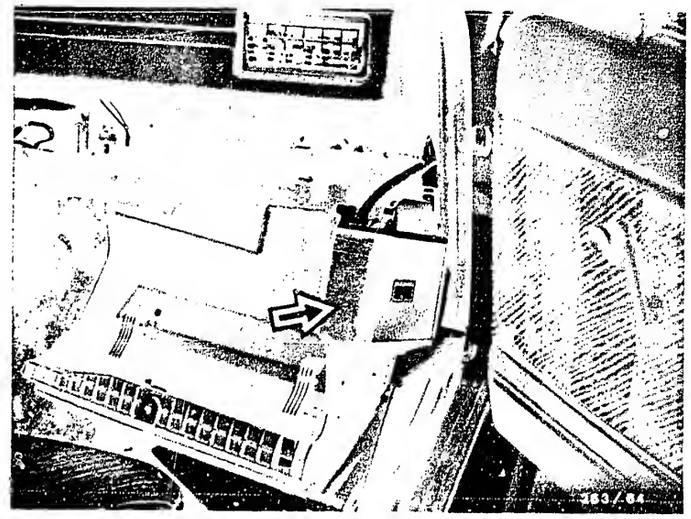
Boost pressure sensor : Integrated in control unit for computerized ignition.

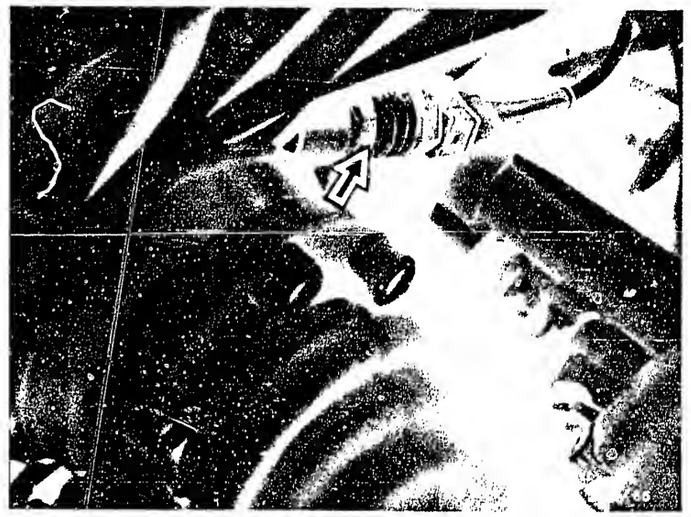
Control unit for computerized ignition : to right of glove compartment (see arrow, top picture)

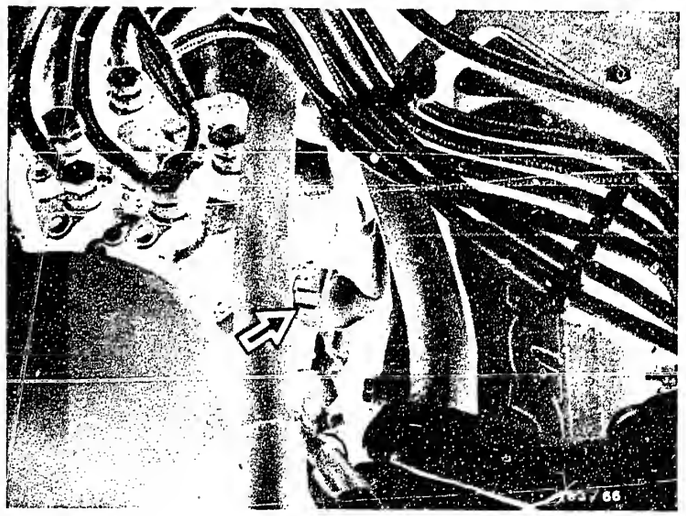
Distance pulse generator : On front differential, accessible from below on vehicle (see arrow, center picture).

Fuel consumption sensor : On K-Jetronic air-flow sensor (see arrow, bottom picture)
Note: Fuel consumption sensor may also be situated on the other side of the air-flow sensor.

Battery : Under rear seat bench (not shown).







7. Trouble-shooting

7.1 Trouble-shooting according to fault symptoms

The fault symptoms listed below may be due to one or more faults.

Before testing: Check the customer complaint (check operation according to owner's manual).

Fault symptom

1. Instrument cluster not lit with ignition on
2. Instrument cluster not lit when full display selected but with ignition on
3. All displays stay for longer than 3 sec after switching on ignition
4. Tachometer display not working
5. Speedometer display not working
6. Fuel gauge display not working
7. Temperature display not working

1	2	3	4	5	6	7	Cause	For testing see Coordinates
●							Battery voltage term. 30/term. 31 not applied to instrument cluster	C18, C20, D13, D15
	●						Reduced-display button defective (lead from reduced-display button)	E 17
●							Open circuit in lead from term. 15	D 17, D19
●							Voltage transformer on instrument cluster defective	F 7
●	●	●	●	●	●	●	Instrument cluster defective; replace	C13, F18
			●				No engine-speed signal from transistorized ignition term. 7	D 21
				●			Distance pulse generator or lead defective	E 3
					●		Tank sender or lead defective	D 1
						●	Temperature sensor or lead defective	D 9
		●					Battery voltage too low	----

8. Consumption display not working (trip computer)	9. Boost pressure display not working	10. No display on trip computer	11. Trip computer indicating incorrect readings	12. Indicator lamp for: Fog lamp, Hazard-warning flashers, upper beam or rear window not lit	13. Indicator lamp for: Warning, generator, turn-signal or oil pressure not lit	14. Indicator lamps for "warning" and "generator" always come on together	15. Indicator lamp for "warning" always lit or not lit	16. Display poorly visible	Causes	For testing see Coordinates
●									Fuel consumption sensor or lead defective	D3...D7
	●								Boost pressure sensor or lead defective	E1
●	●	●	●	●	●	●			Replace instrument cluster or corresponding sensors	C22...D9 D23...E3,E7
				●	●				Bulbs defective, replace	E19...F3
				●					No ground connection (in car)	C 18
					●				No connection from terminal 15 (in car)	D 17
					●				Oil pressure switch defective	D 23
						●			Battery charging defective	E 5
							●		Speech synthesizer module defective	F 9
								●	Display brightness control or plug defective	F 5

17. Changeover mph - km in time of day setting with reset button pressed 2 sec, not working	18. Changeover from turbo to naturally-aspirated engine not working	19. Instantaneous consumption display not working (right-hand display)	20. Overrun cutoff not working	21. Tank reserve display "E" does not change to "L" when changing over	22. 12hr display defective on Quattro	23. No code indicated in tank calibration mode on display	24. Reduced-display changeover not working	25. Automatic reduced-display changeover not working	Cause	For testing see Coordinates
●									Reset button defective (no ground connection)	E 15
●	●	●	●	●	●	●	●	●	Instrument cluster defective (replace)	C13, F18
		●							Fuel consumption sensor defective or lead	D3...D7
			●						No signal for overrun cutoff	D 11
							●		Lead terminal 15 or switch defective	E 17
●	●	●			●				incorrect coding on instrument cluster	A13, A14

7.2 Trouble-shooting according to test steps

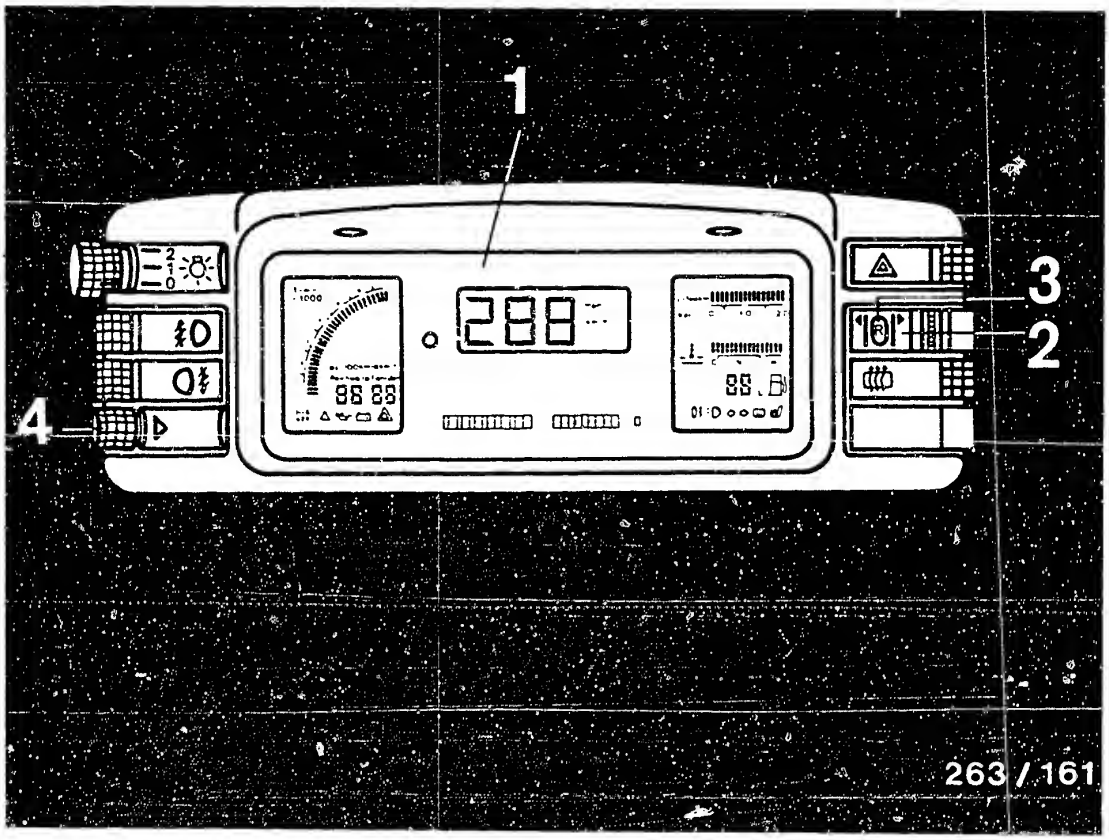
- Before testing:
  Check the customer complaint (check operation of instrument cluster in accordance with owner's manual).

- Electrical system (fuses, battery voltage etc.) O.K.

- When working on the fuel system, observe accident prevention regulations as well as environmental and health regulations.

- Check all functions with the vehicle stationary and before removing the instrument cluster.

When performing the detailed trouble-shooting starting on Coordinate C 1 go through the test steps one after the other.
Only if a malfunction is indicated, continue with the trouble-shooting which is set out below each test step.



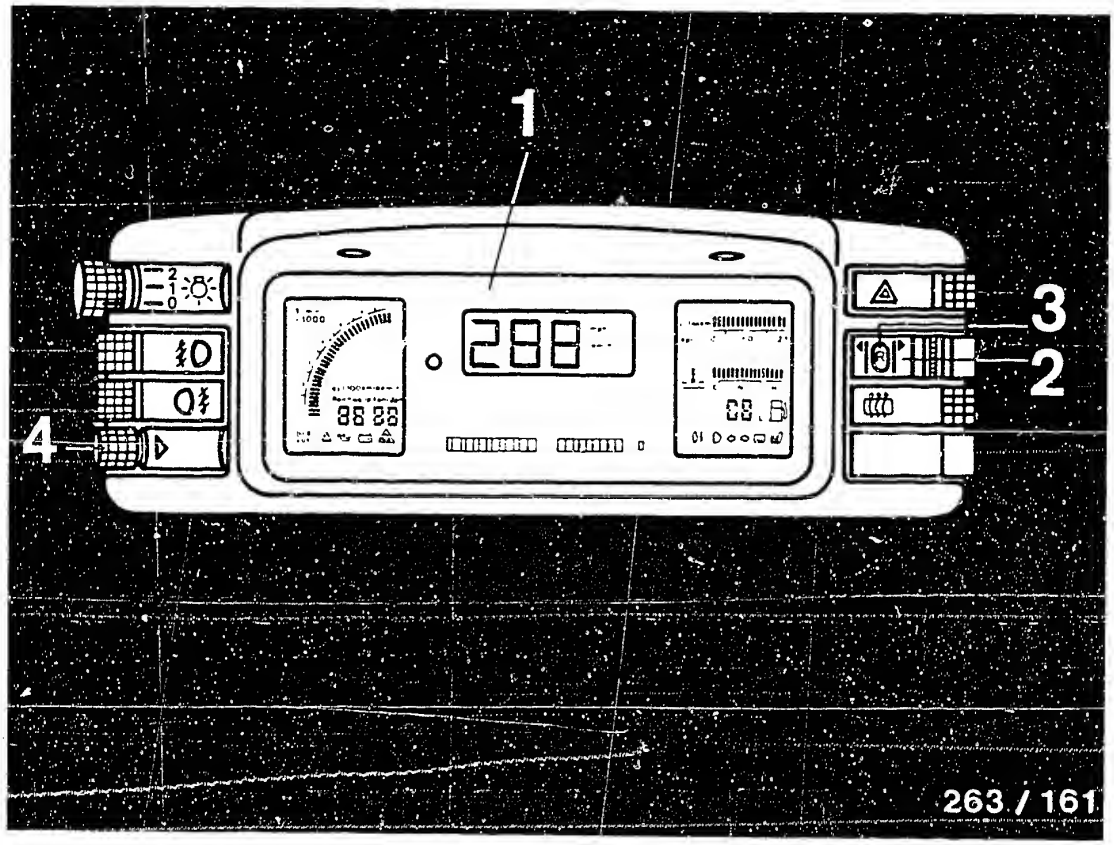
1 = Instrument cluster
2 = Rocker switch for trip computer functions
3 = Reset switch
4 = Reduced-display switch and display brightness control

7.3 Functional test of the instrument cluster

Functional test with ignition OFF

Press reset button (3):

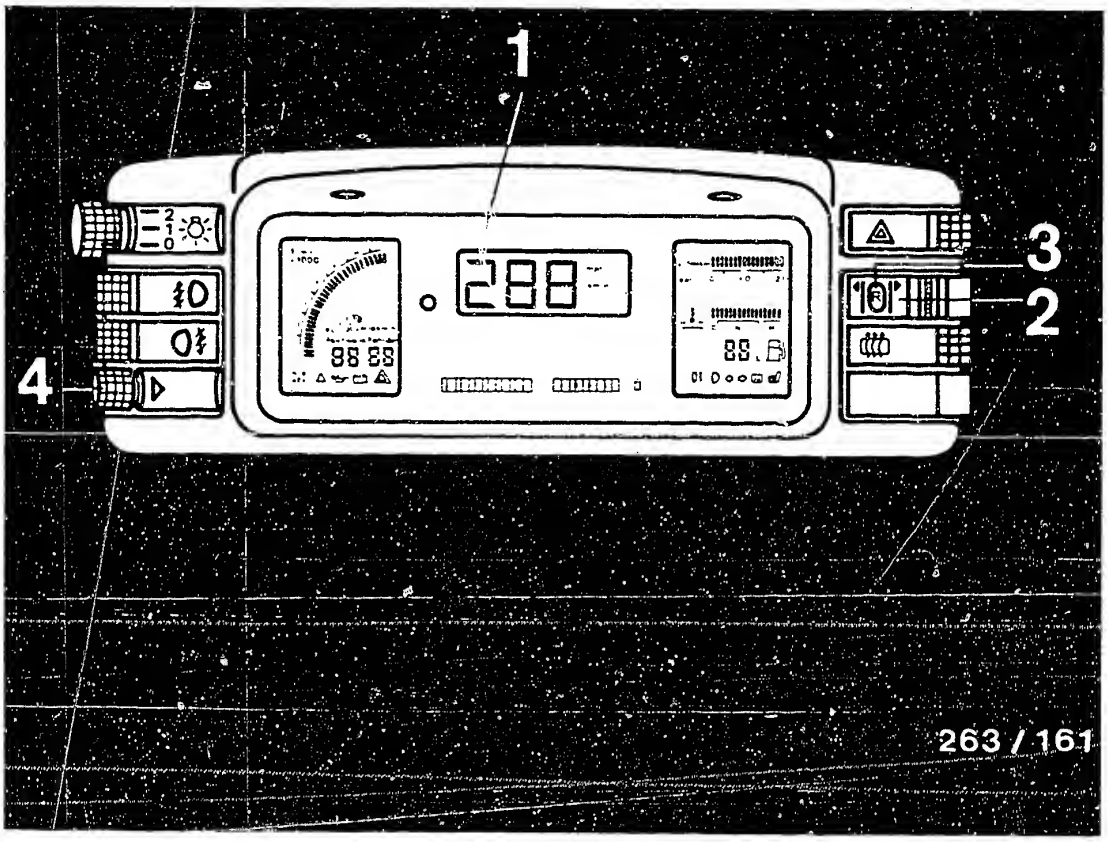
The on-board computer indicates the time of day.



Functional test with ignition ON, engine not running

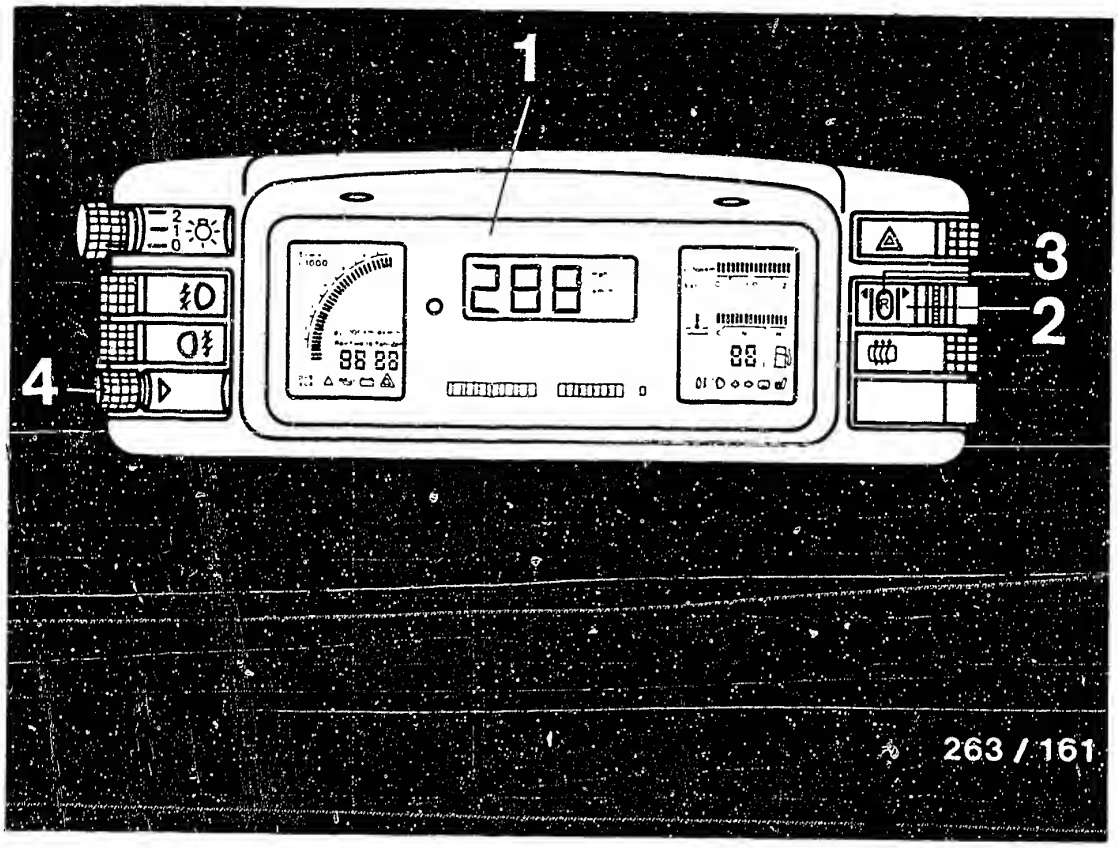
When the ignition is switched on, all electronic displays are automatically energized for a period of 3 seconds. The digital displays of the speedometer and of the trip computer each show a 2 in the first digit for 1 second and then a 1.
Then

speed display:	0 km/h (0 mph)
engine speed:	no segments
trip computer shows selected function.	
Boost pressure (turbo engine)	Atmospheric pressure approx. 1 bar
for naturally-aspirated engines	Instantaneous consumption (0 l)
coolant temperature:	current temperature
tank level:	current level.



Functional test with ignition ON, engine running, vehicle at standstill.

Speedometer reading:	0 km/h
Engine speed:	Current value
Charge-air pressure (turbo eng.):	Current value
for nat.-asp. engines	Instantan. consumption
Coolant temperature:	Current value
Fuel gauge	Current value



Functional test with ignition ON, engine running, vehicle at standstill (continued)

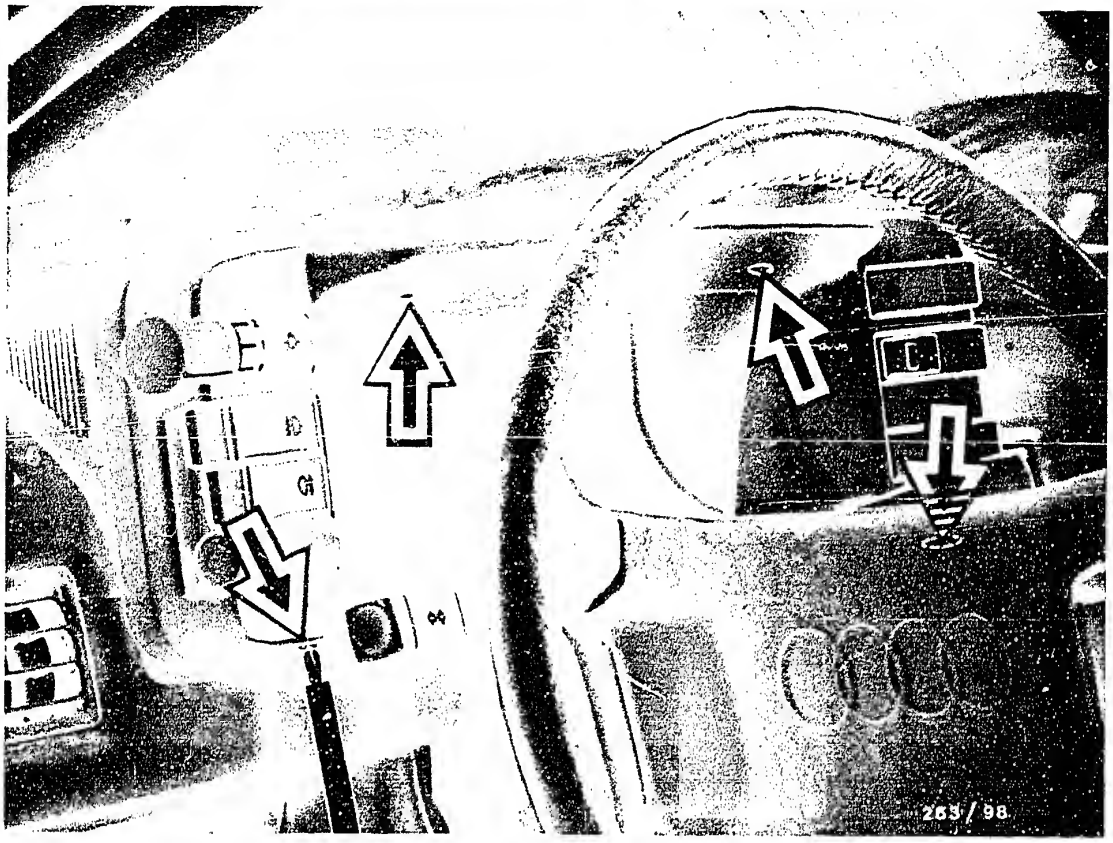
The on-board computer indicates the function selected as follows for instrument cluster 0 263 220 ..

..009/010	..011/012	
Ø km/h	AVE MPH	= actual value from last resetting
Reichweite	FUEL Range	= Distance that can still be covered, calculated from the average consumption over the last 30 km and the remaining fuel in the tank.

Functional test with ignition ON, engine running, vehicle stationary (continued)

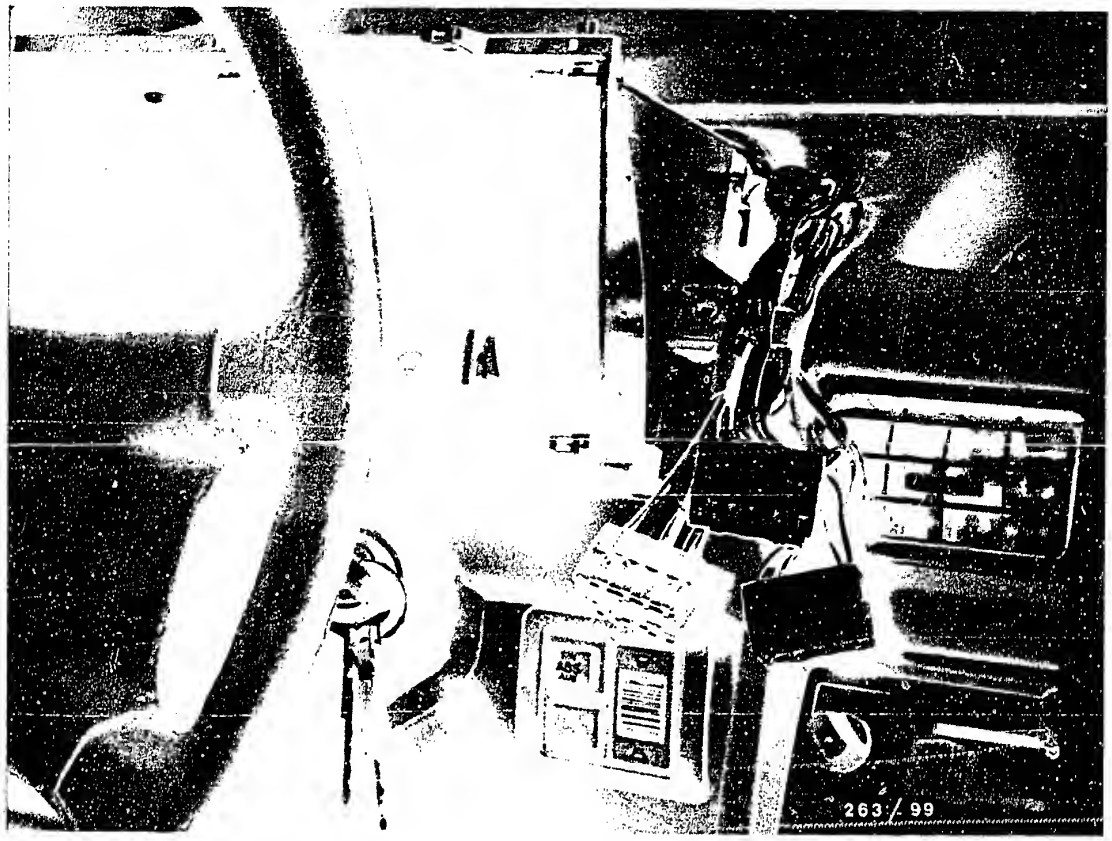
Trip computer shows selected function for instrument cluster 0 263 220 ..

..009/010	..011/012	
Fahrzeit	ELPSD	= outright driving time, without breaks, calculated from the last resetting
Zeit	TIME	= Time of day
Momentan-verbrauch	MPH	Ø Average consumption of previous driving phase after last resetting.



7.4 Removing the instrument cluster

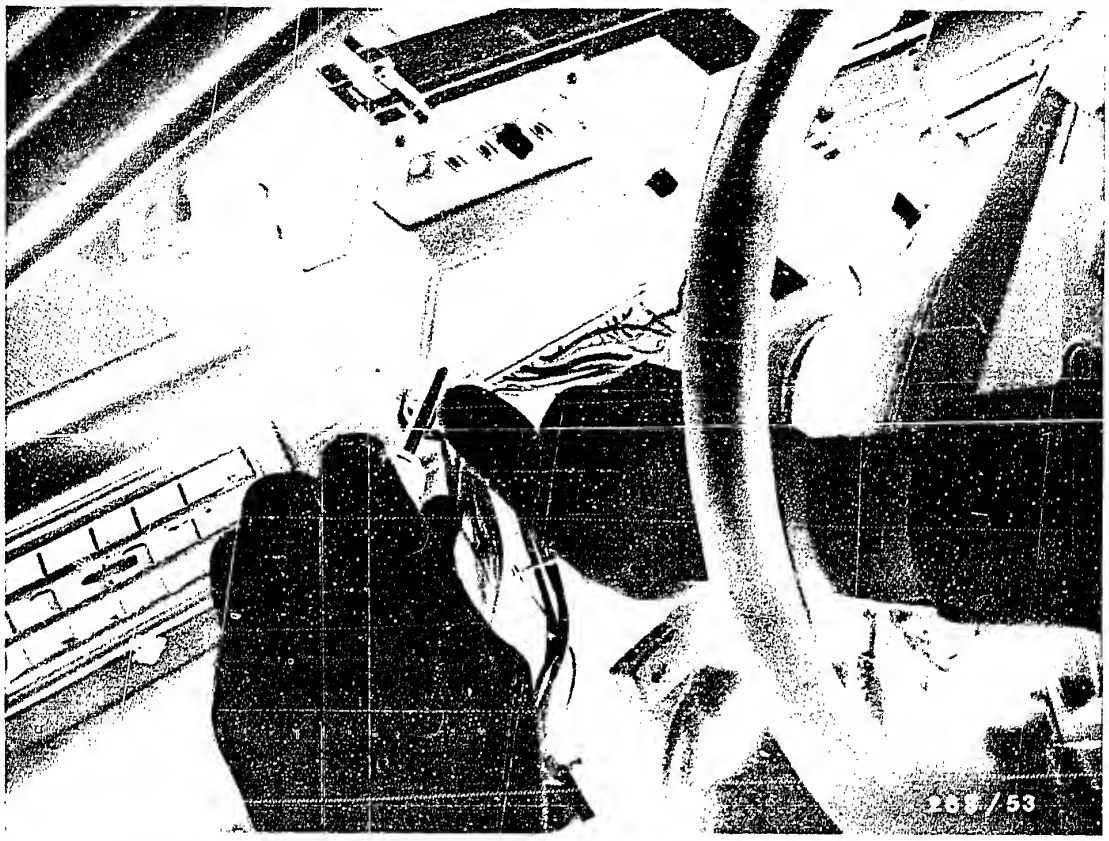
Remove four recessed-head screws (see picture, arrows).
Take off instrument cluster cover.



After removing the cover, disconnect plug from control buttons. Frame with control buttons can now be taken off.

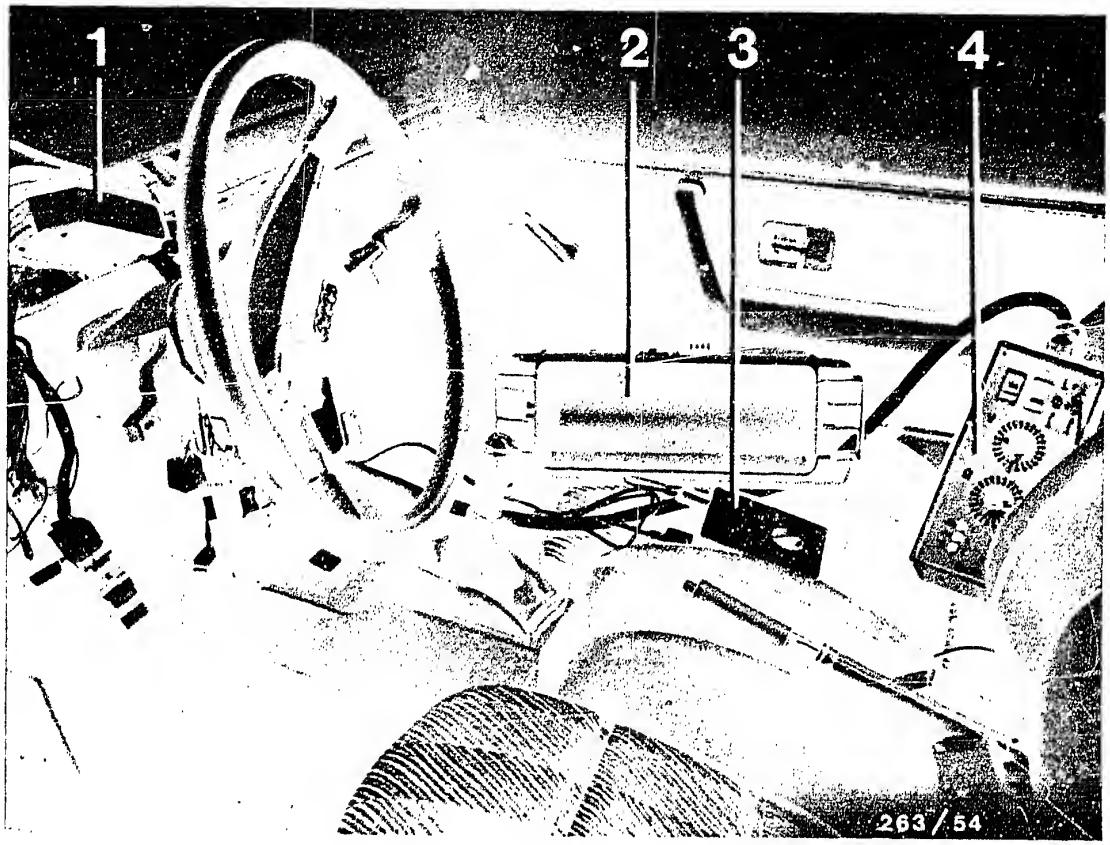
Plugs are color-coded and cannot be mixed up when assembling.

Remove fastening screws (recessed-head screws) on right and left on instrument cluster.



Flip up the instrument cluster and disconnect the 35-pole plug.

To do this, carefully lift the catch on the wiring harness plug using your thumb, and the 35-pole plug using the blade of a screwdriver. (See the Figure.)



1 = Connecting plug for the adapter lead plugged on the 35-pole connector of the vehicle wiring harness.

2 = Instrument cluster with the 35-pole connector for the adapter lead plugged on it

3 = Analog multimeter

4 = Universal test adapter with adapter lead KDES 0011 connected to it

7.5 Connecting the universal test adapter

8. Trouble-shooting program

The detailed trouble-shooting program below is intended to enable the workshop employees, using the universal test adapter 0 648 101 801 and suitable test equipment, to detect quickly the causes for defects on the instrument cluster, the wiring harness, and sensors. The step-by-step approach adopted in this trouble-shooting program makes it possible for such faults to be detected quickly even by workshop employees who have had little experience or practice on the vehicle..

Test step 1

Operation		Reading	Testing
Program switch setting "V"	↓	On the multimeter: approx. 0...10 Ω	Component: Connection from vehicle ground to the instrument cluster, Pin 14
Program switch setting "Ω"	1		Operation: Measurement of resistance, continuity
Test equipment Universal test adapter * Multimeter *			Malfunction: Reading ∞ Ω
Range of measurement:	Ω x 1		
Connection: Blue test socket Operation in vehicle: —			

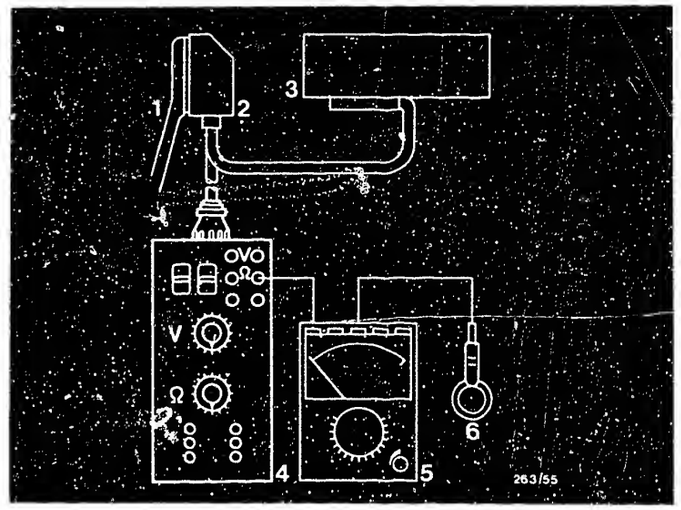
* Note:

For this test step, connect the ohmmeter to only one ohm socket on the universal test adapter. Connect the other lead of the ohmmeter to vehicle ground (see top picture).

Possible defects:

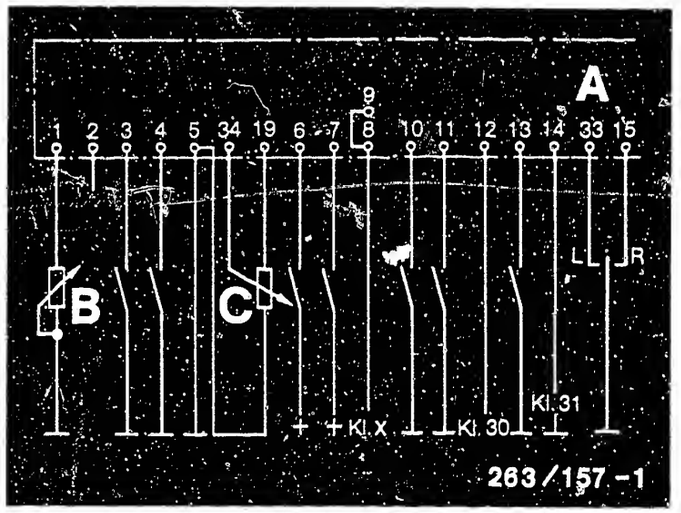
There is a break or contact resistance in the lead from the central ground to pin 14.

Eliminate the break or contact resistance for the ground lead to Terminal 14 of the instrument cluster.



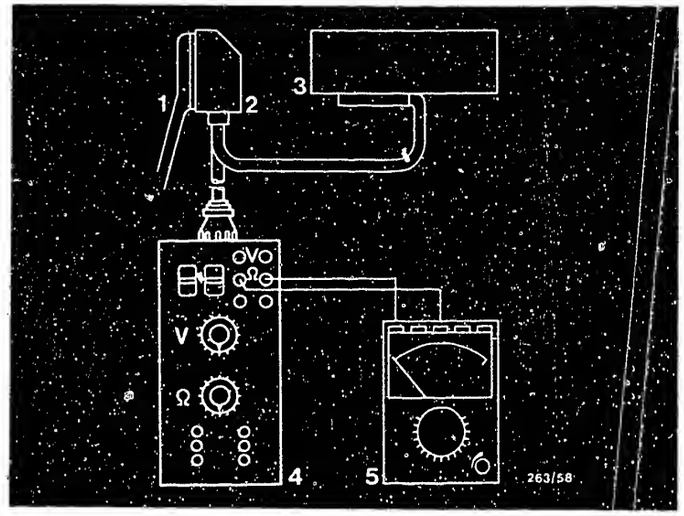
1 = 35-pole connector to the vehicle wiring harness
2 = Adapter lead
3 = Instrument cluster
4 = Universal test adapter
5 = Multimeter
6 = Cigarette lighter

Partial connection diagram for the vehicle wiring harness to the instrument cluster



Test step 2

Operation		Reading	Testing
Program switch setting "V"	⬇	On the multimeter: approx. 0...10 Ω	Component: Connection from vehicle ground to the instrument cluster, Pin 18
Program switch setting "Ω"	6		Operation: Measurement of resistance, continuity
Test equipment: Universal test adapter Multimeter			Malfunction: Reading ∞ Ω
Range of measurement: Ω x 1			
Connection: Blue test socket			
Operation in vehicle: —			



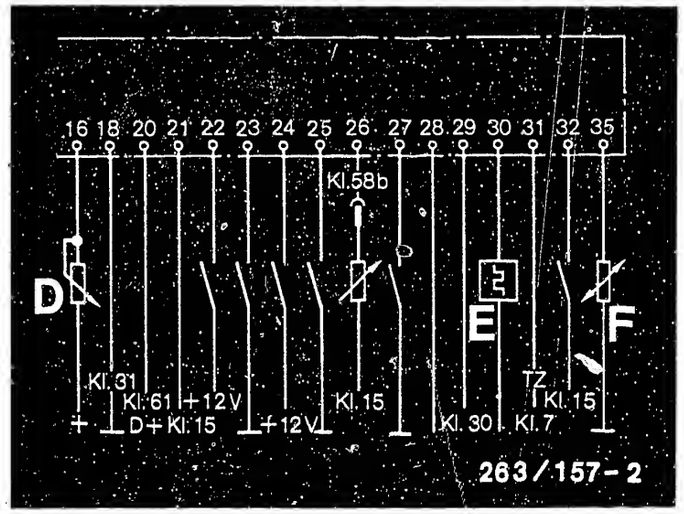
1 = 35-pole connector to the vehicle wiring harness
2 = Adapter lead
3 = Instrument cluster
4 = Universal test adapter
5 = Multimeter

Possible defects:

There is a break or contact resistance in the lead from the central ground to pin 18.

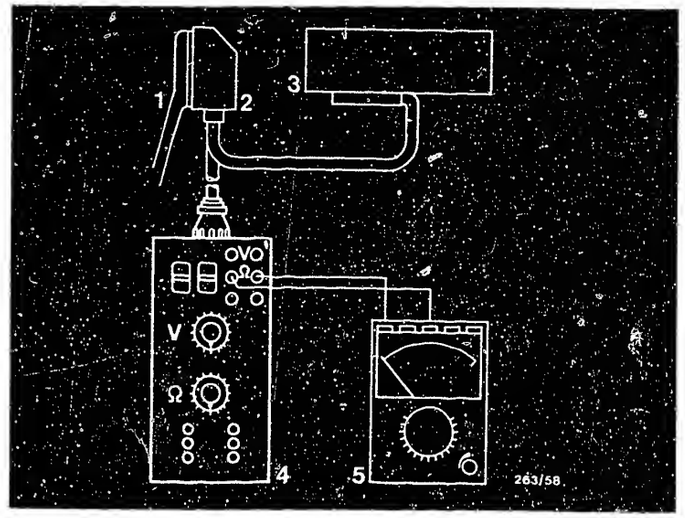
Eliminate the break or contact resistance to pin 18 of the instrument cluster.

Partial connection diagram for the vehicle wiring harness to the instrument cluster



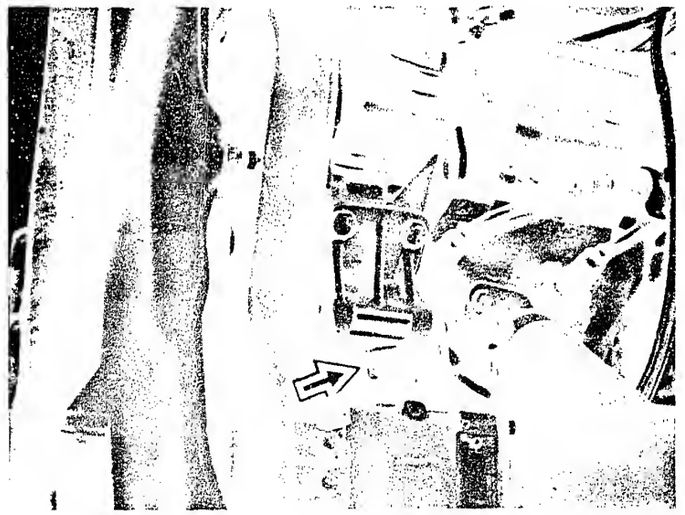
Test step 3

Operation		Reading	Testing
Program switch setting "V"	↓	On the multimeter: R_{20} = approx. 1 k Ω R_{40} = approx. 500 Ω R_{60} = approx. 250 Ω R_{90} = approx. 100 Ω R_{120} = approx. 50 Ω	Component: Temperature sensor for coolant Pin 35
Program switch setting "Ω"	7		Operation: Measurement of resistance
Test equipment: Universal test adapter Multimeter			Malfunction: 0 Ω (short-circuit) ∞ Ω (break)
Range of measurement: Ω x 10			
Connection: Blue test socket			
Operation in vehicle: Ignition OFF			
Additional operation: Disconnect plug on the instrument cluster.			



1 = 35-pole connector to the vehicle wiring harness
2 = Adapter lead
3 = Instrument cluster
4 = Universal test adapter
5 = Multimeter

Temperature sensor connection (arrow)



Possible defects:

Broken off or short-circuited lead on temperature sensor.
Break on lead to the instrument cluster.
Temperature sensor defective.

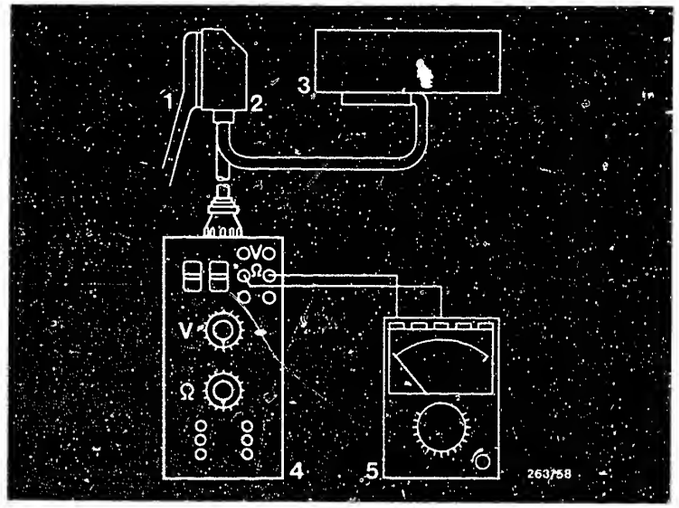
Note on measurement: R_{20} means resistance at 20°C

R_{40} at 40°C, etc.

Take out and replace the leads to the temperature sensor or the sensor itself.
Take out and replace the leads to the instrument cluster Pin 35.

Test step 4

Operation		Reading	Testing
Program switch setting "V"	⬇	On the multimeter:	Component: Tank sensor Pin 1
Program switch setting "Ω"	8	R_{empty} = approx. 300 Ω R_{full} = approx. 30 Ω	Operation: Measurement of resistance
Test equipment: Universal test adapter Multimeter			Malfunction: No reading or incorrect reading
Range of measurement: Ω x 10			
Connection: Blue test socket			
Operation in vehicle: —			
Additional operation: Disconnect plug on the instrument cluster.			

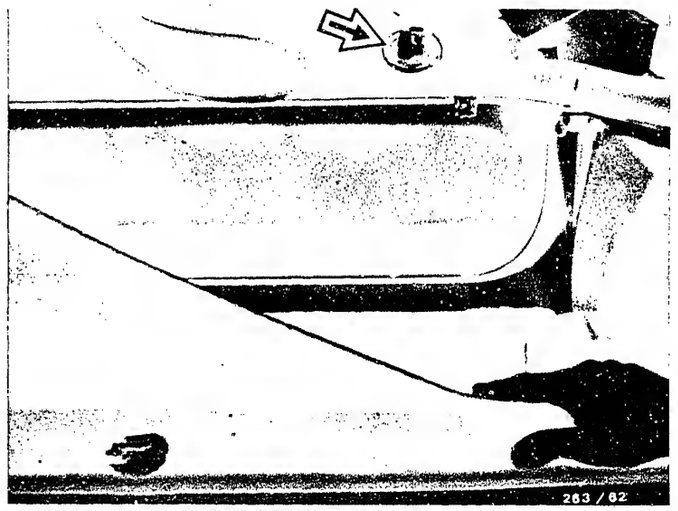


1 = 35-pole connector to the vehicle wiring harness
2 = Adapter lead
3 = Instrument cluster
4 = Universal test adapter
5 = Multimeter

Possible defects:

There is a break or contact resistance in the lead to the tank sensor.
Pin Term. 1 of the instrument cluster is defective.
Tank sensor is defective

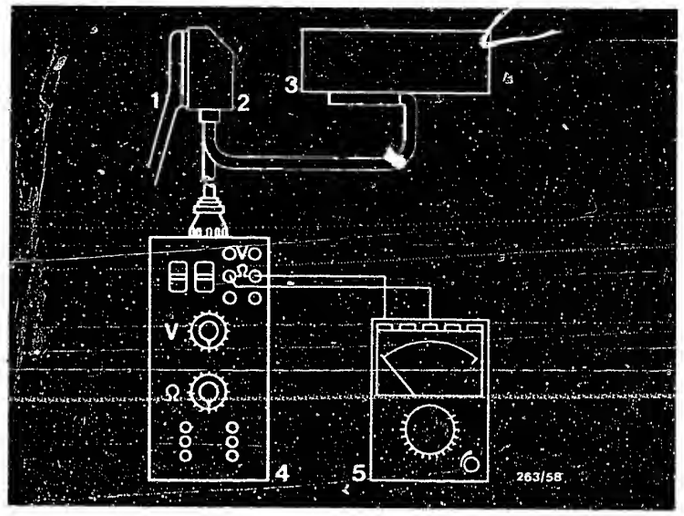
Take out and replace defective parts, such as the lead to the tank sensor or the tank sensor itself.



Tank sensor (arrow) (accessible from the luggage compartment)

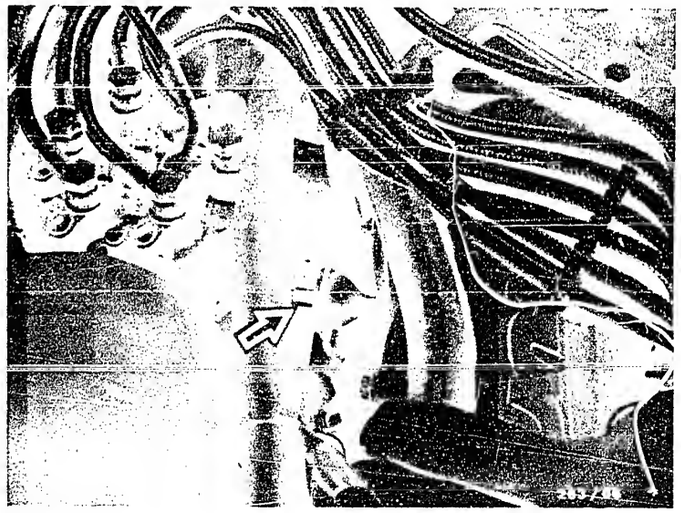
Test step 5

Operation		Reading	Testing
Program switch setting "V"	⬇	On the multimeter: approx. 0...10 Ω	Component: Ground lead from the fuel-consumption sensor Pin 5
Program switch setting "Ω"	11		Operation: Measurement of continuity
Test equipment: Universal test adapter Multimeter			Malfunction: ∞ Ω if there is a break in the lead
Range of measurement: Ω x 1			
Connection: Blue test socket			
Additional operation: Plug connected to instrument cluster.			



1 = 35-pole connector to the vehicle wiring harness
2 = Adapter lead
3 = Instrument cluster
4 = Universal test adapter
5 = Multimeter

Installation position of the fuel-consumption sensor (arrow)



Possible defects:

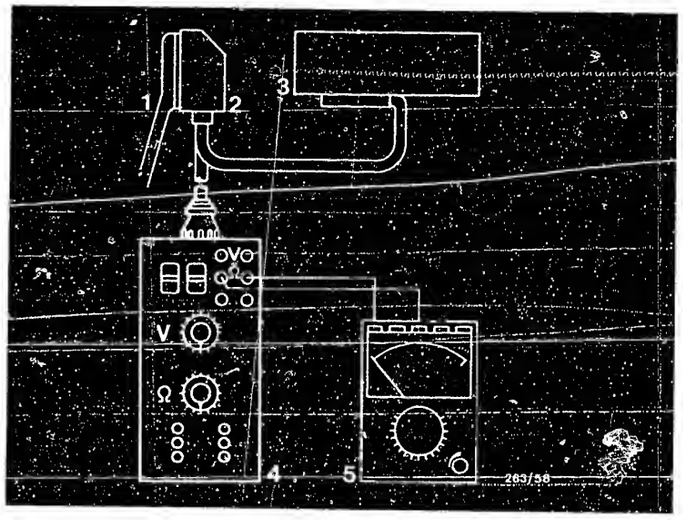
There is a break in the ground lead to the fuel-consumption sensor.

The ground lead to Terminal 5 above the instrument cluster is missing.

Eliminate the break in the lead.

Test step 6

Operation		Reading	Testing
Program switch setting "V"	↓	On the multimeter:	Component: Fuel-consumption sensor Pin 19 to 5 (Ground)
Program switch setting "Ω"	12	3000...5000 Ω	
Test equipment: Universal test adapter Multimeter			Operation: Measurement of resistance
Range of measurement: Ω x 10			Malfunction: Resistance > 5000 Ω < 3000 Ω
Connection: Blue test socket			
Operation in vehicle: —			
Additional operation: Disconnect plug on the instrument cluster.			



1 = 35-pole connector to the vehicle wiring harness
2 = Adapter lead
3 = Instrument cluster
4 = Universal test adapter
5 = Multimeter

Possible defects:

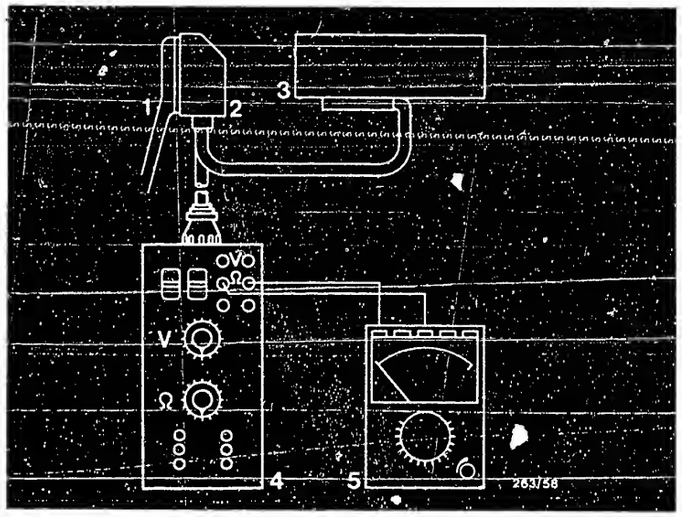
Break in lead from Pin 5 to Pin 23.
Resistor of the fuel-consumption sensor defective.
Take out and replace the lead to the fuel-consumption sensor.
Take out and replace the fuel-consumption sensor.
Adjustment takes place at test step 19.

Taking out and replacing the fuel-consumption sensor.

Take apart the 3-pole plug connection to the potentiometer (attached to the air-flow sensor). Scratch off the locking paint from the 4 fastening screws and unscrew the fastening screws. Carefully remove the potentiometer. Do not touch the brush-type wiper. Position the new brush housing with the seal ring inserted into it. Screw in the fastening screws, and finger-tighten them.

Test step 7

Operation		Reading	Testing
Program switch setting "V"	↓	On the multimeter: 500 ... 900 Ω	Component: Fuel-consumption sensor Pin 34 to 5 (Wiper)
Program switch setting "Ω"	13		Operation: Measurement of resistance
Test equipment: Universal test adapter Multimeter			Malfunction: Resistance > 900 Ω < 500 Ω
Range of measurement: Ω x 10			
Connection: Blue test socket			
Operation in vehicle: —			
Additional operation: Disconnect plug on the instrument cluster.			



1 = 35-pole connector to the vehicle wiring harness
2 = Adapter lead
3 = Instrument cluster
4 = Universal test adapter
5 = Multimeter

Possible defects:

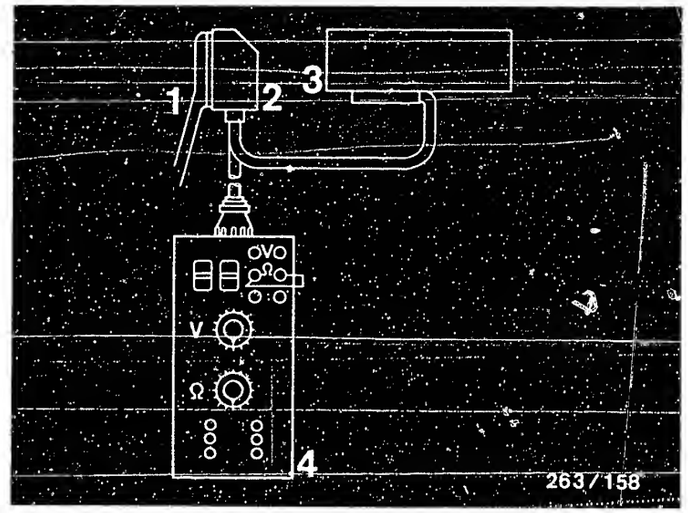
Break in lead from pin 34 to pin 5.
Take out and replace the resistor of the fuel-consumption sensor.
Take out and replace the fuel-consumption sensor.
Adjustment takes place in test step 19.

Taking out and replacing the fuel-consumption sensor.

Take apart the 3-pole plug connection to the potentiometer (attached to the air-flow sensor). Scratch off the locking paint from the 4 fastening screws and unscrew the fastening screws. Carefully remove the potentiometer. Do not touch the brush-type wiper. Position the new brush housing with the seal ring inserted into it. Screw in the fastening screws, and finger-tighten them.

Test step 8

Operation		Reading	Testing
Program switch position "V"	⬇	on instrument cluster Temperature display at hot, flashing	Component: Connection between vehicle ground and instrument cluster terminal 11
Program switch position "Ω"	20		
Measuring equipment: Universal test adapter			Operation: Coolant temperature display
Connection: Blue test socket			
Operation in vehicle: Ignition ON			Malfunction: Temperature display does not move to hot, flashing.
Addition operation: Plug connected on instrument cluster			



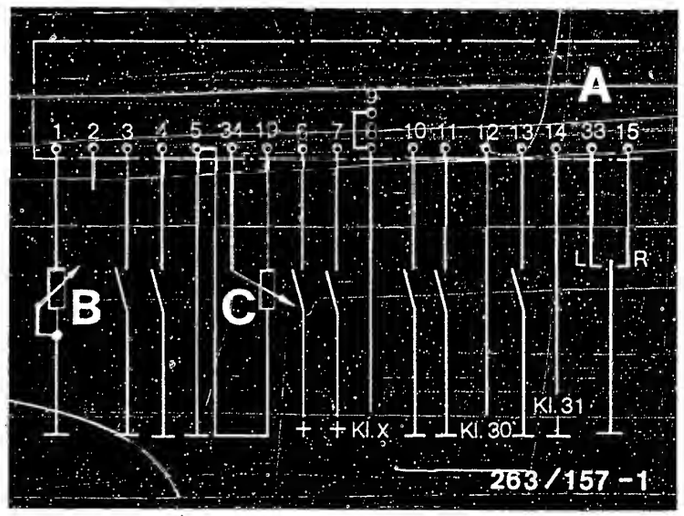
1 = 35-pin connector on vehicle wiring harness
2 = Adapter lead
3 = Instrument cluster
4 = Universal test adapter
5 = Multimeter
6 = Cigarette lighter

Partial terminal diagram of vehicle wiring harness to instrument cluster

Possible faults:

Thermo-switch in engine block defective.
Open circuit in lead between thermo-switch and instrument cluster terminal 11.

Note: For this test step, jump OHM sockets on universal test adapter.



Test step 9

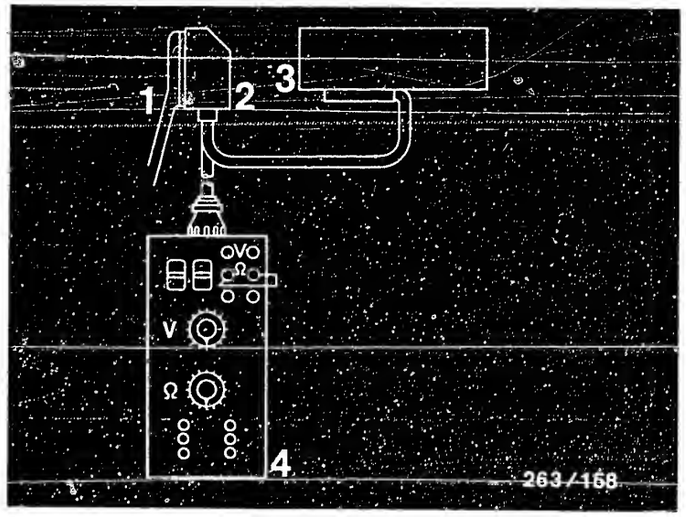
Operation		Reading	Testing
Program switch position "V"	⬇	on instrument cluster: in right-hand display field, instead of boost pressure display an instantaneous consumption of 0 l/h (for naturally-aspirated engines only)	Component: Connection between vehicle ground and instrument cluster terminal 25
Program switch position "Ω"	21		
Measuring equipment: Universal test adapter			Operation: Instantaneous consumption display for naturally-aspirated engines
Measuring range: ---			Malfunction: Instantaneous consumption display > 0 l
Connection: Blue test socket			
Operation in vehicle: Ignition ON			

Possible faults:

Open circuit in lead between throttle-valve switch and instrument cluster terminal 21.

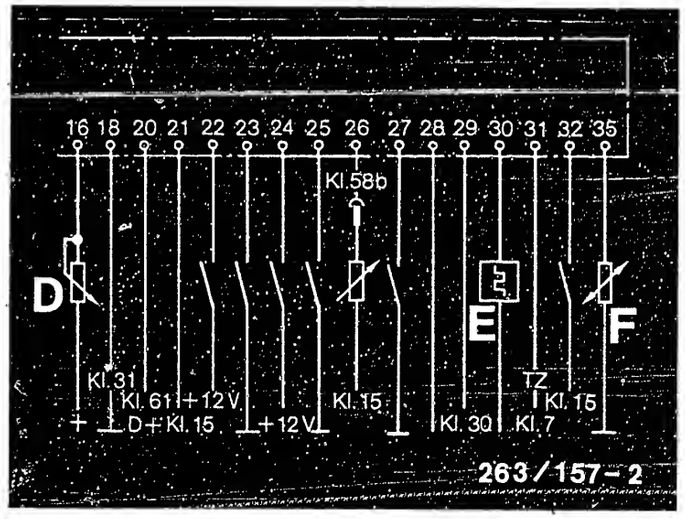
Throttle-valve switch defective.

Note: For this test step, jump OHM sockets on universal test adapter.



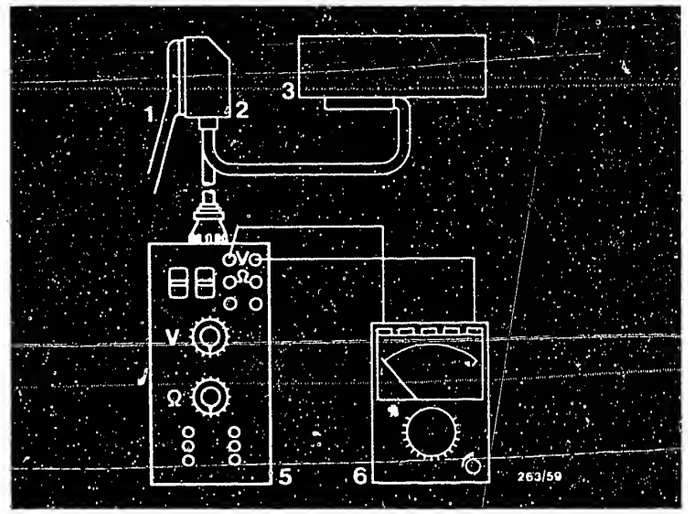
1 = 35-pin connector on vehicle wiring harness
2 = Adapter lead
3 = Instrument cluster
4 = Universal test adapter
5 = Multimeter
6 = Cigarette lighter

Partial terminal diagram of vehicle wiring harness to instrument cluster



Test step 10

Operation		Reading	Testing
Program switch setting "V"	1	On the multimeter: Battery voltage	Component: Voltage supply for instrument cluster Pin 12
Program switch setting "Ω"	--		Operation: Measurement of voltage
Test equipment: Universal test adapter Multimeter			Malfunction: No voltage present
Range of measurement: 0 ... 15 V			
Connection: Red test socket = + Black test socket = -			
Operation in vehicle: ——			



1 = 35-pole connector to the vehicle wiring harness
2 = Adapter lead
3 = Instrument cluster
4 = Universal test adapter
5 = Multimeter

Fuse box in the engine compartment

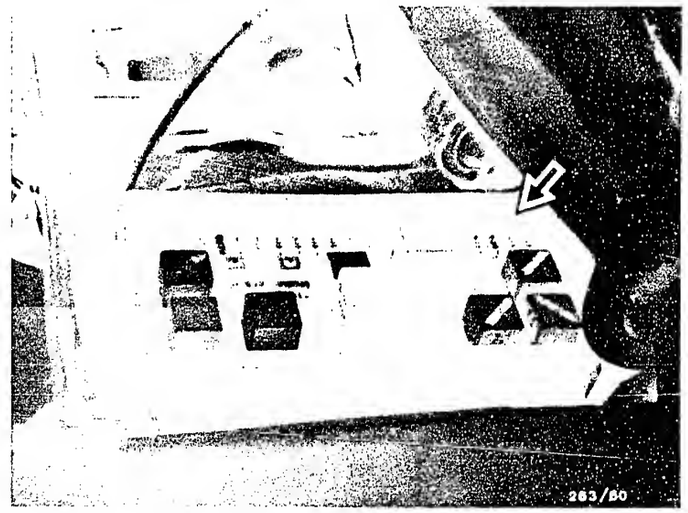
Possible defects:

The lead from Term. 30 has no connection to Pin 12 on the instrument cluster.

Fuse No. 3 (25 A) in the fuse box (see Figure at bottom) has blown.

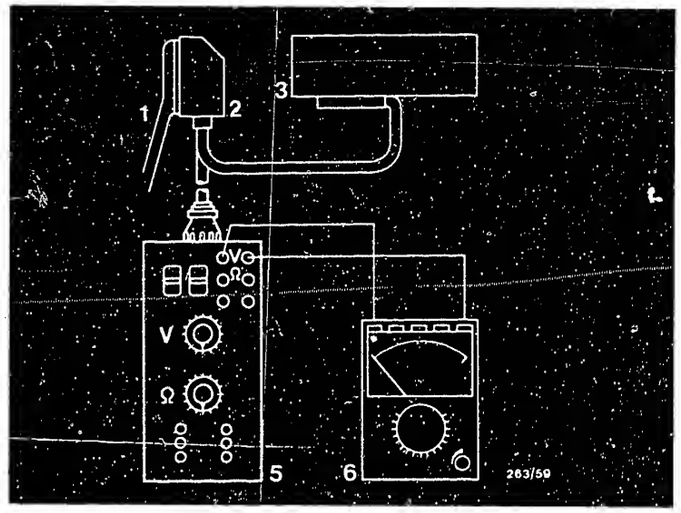
Eliminate break in the power supply lead to Pin 12.

If necessary, take out and replace fuse No. 3 (25 A).



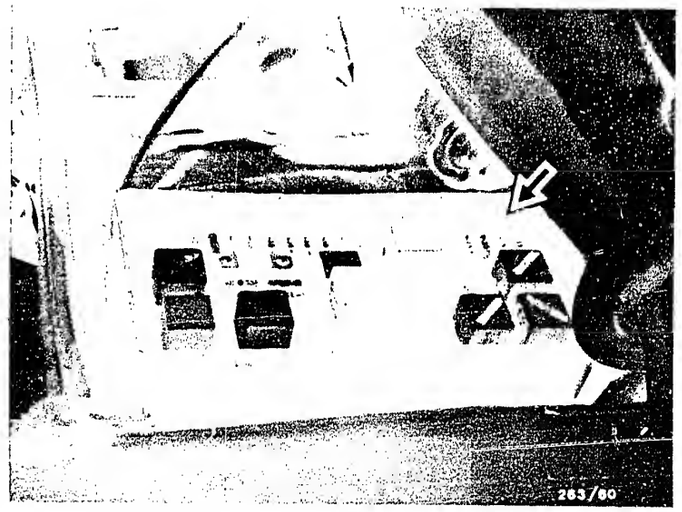
Test step 11

Operation		Reading	Testing
Program switch setting "V"	2	On the multimeter:	Component:
Program switch setting "Ω"	--	Battery voltage	Voltage supply for instrument cluster Pin 29
Test equipment: Universal test adapter Multimeter			Operation: Measurement of voltage
Range of measurement: 0 ... 15 V			Malfunction: No voltage present
Connection: Red test socket = + Black test socket = -			
Operation in vehicle: ——			



1 = 35-pole connector to the vehicle wiring harness
2 = Adapter lead
3 = Instrument cluster
4 = Universal test adapter
5 = Multimeter

Fuse box in the engine compartment



Possible defects:

Lead from Term. 30 has no connection to Pin 29 of the instrument cluster.

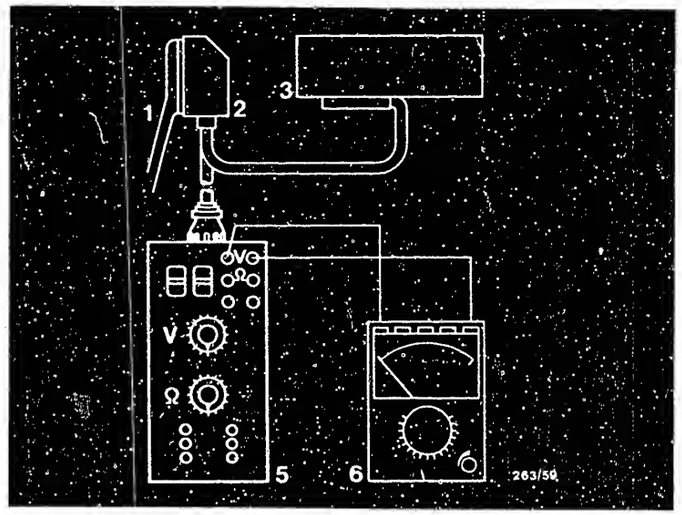
Fuse No. 3 (25 A) in the fuse box has blown.

Eliminate break in the power supply lead from Term. 30 to Pin 29.

If necessary, take out and replace fuse No. 3 (25 A).

Test step 12

Operation		Reading	Testing
Program switch setting "V"	3	On the multimeter: Battery voltage	Component: Power supply for instrument cluster via ignition lock Pin 21
Program switch setting "Ω"	--		
Test equipment: Universal test adapter Multimeter			Operation: Measurement of voltage
Range of measurement: 0 ... 15 V			Malfunction: No voltage after "ignition ON" Battery voltage too low
Connection: Red test socket = + Black test socket = -			
Operation in vehicle: Ignition ON			



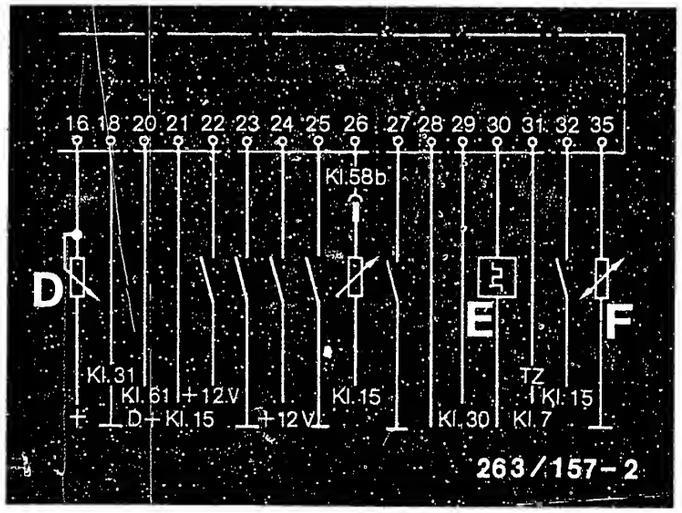
1 = 35-pole connector to the vehicle wiring harness
2 = Adapter lead
3 = Instrument cluster
4 = Universal test adapter
5 = Multimeter

Possible defects:

The lead from the ignition lock Term. 15 to the instrument cluster Pin 21 has a break or contact resistance.

Eliminate the break and the contact resistances in the power supply lead from Terminal 15 to the instrument cluster Pin 21.

Partial connection diagram for the vehicle wiring harness to the instrument cluster



Test step 13

Operation		Reading	Testing
Program switch setting "V"	4	On the multimeter: 1. approx. 12 V 2. approx. 0 V	Component: Power supply for instrument cluster via ignition lock Pins 8/9
Program switch setting "Ω"	--		Operation: Measurement of voltage
Test equipment: Universal test adapter Multimeter			Malfunction: No voltage after "ignition ON" Battery voltage too low
Range of measurement: 0 ... 15 V			
Connection: Red test socket = + Blue test socket = -			
Operation in vehicle: 1. Ignition ON 2. Activate starting motor briefly			

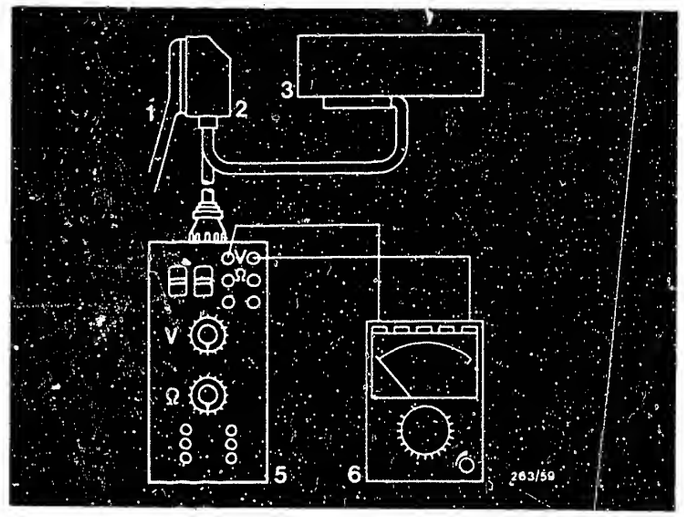
Possible defects:

The lead from the ignition lock Term. X to the instrument cluster Pins 8/9 has a break or contact resistance.

Fuse No. 16 (30 A) in the fuse box has blown.

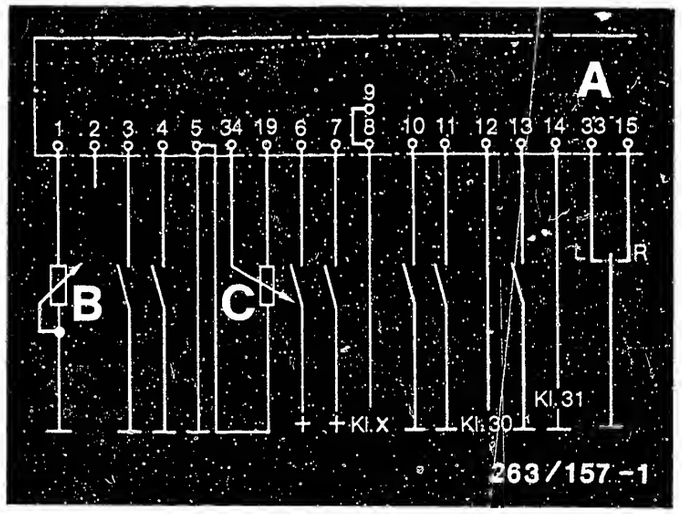
Eliminate the break and contact resistances in the power supply lead from Terminal 15 to the instrument cluster Pin 21.

If necessary, take out and replace fuse No. 16 (30 A).

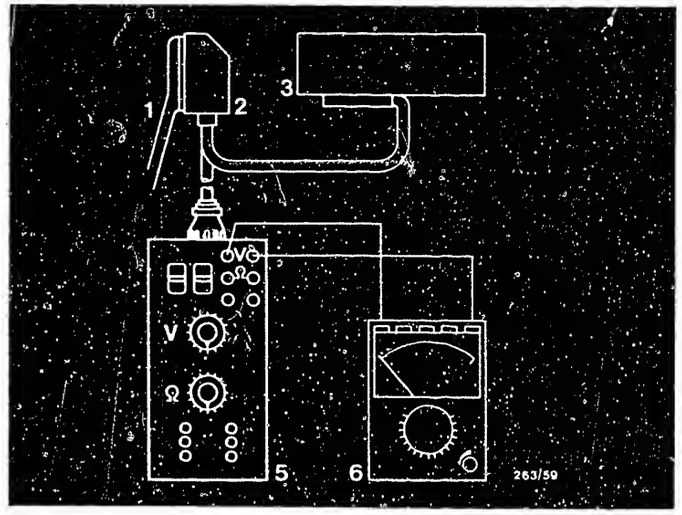


1 = 35-pole connector to the vehicle wiring harness
2 = Adapter lead
3 = Instrument cluster
4 = Universal test adapter
5 = Multimeter

Partial connection diagram for the vehicle wiring harness to the instrument cluster



Test step 14			
Operation		Reading	Testing
Program switch setting "V"	7	On the multimeter: approx. 0.7 V	Component: Ignition trigger box Pin 31
Program switch setting "Ω"	--		
Test equipment: Universal test adapter Multimeter			Operation: Measurement of voltage Engine speed signal
Range of measurement: 0 ... 5 V			
Connection: Red test socket = + Blue test socket = -			Malfunction: No voltage
Operation in vehicle: Ignition ON			
Additional operation: Engine idling.			



1 = 35-pole connector to the vehicle wiring harness
2 = Adapter lead
3 = Instrument cluster
4 = Universal test adapter
5 = Multimeter

Possible defects:

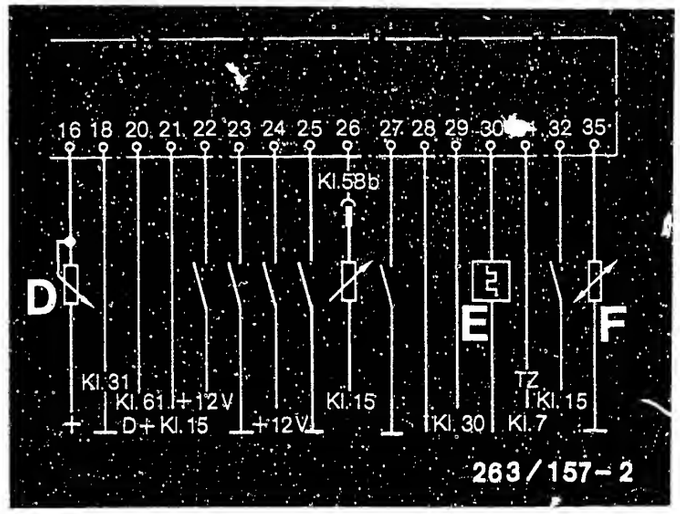
Break in lead or short-circuit at Pin 31 on the instrument cluster.

The plug at Term. 7 of the ignition trigger box is not making contact.

Note:

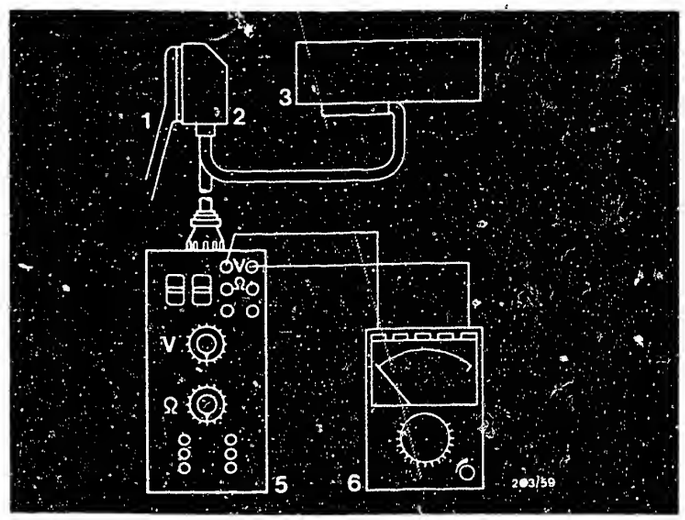
The ignition trigger box is located at the top in the glove compartment/water box.
Eliminate break in lead or short-circuit.

Partial connection diagram for the vehicle wiring harness to the instrument cluster



Test step 15

Operation		Reading	Testing
Program switch setting "V"	8	On the multimeter: 12 V	Component: Oil-pressure switch Pin 3
Program switch setting "Ω"	--		Operation: Opens at oil pressure of 0.35 bar
Test equipment: Universal test adapter Multimeter			Malfunction: At 0 V
Range of measurement: 0 ... 15 V			
Connection: Red test socket = + Blue test socket = -			
Operation in vehicle: Ignition ON Start the engine			
Additional operation: Have engine run until oil pressure rises above 0.35 bar			



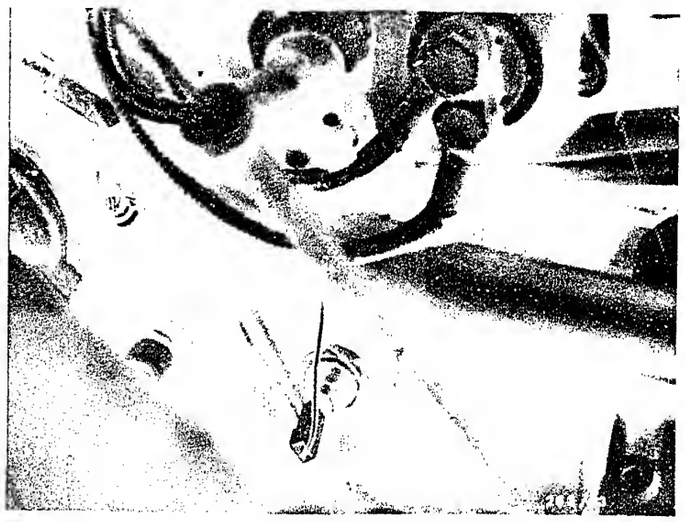
1 = 35-pole connector to the vehicle wiring harness
2 = Adapter lead
3 = Instrument cluster
4 = Universal test adapter
5 = Multimeter

Possible defects:

Break in lead. The plug on the oil-pressure switch has slipped off - there is a break at Pin 3 on the instrument cluster.
The oil-pressure switch is defective.

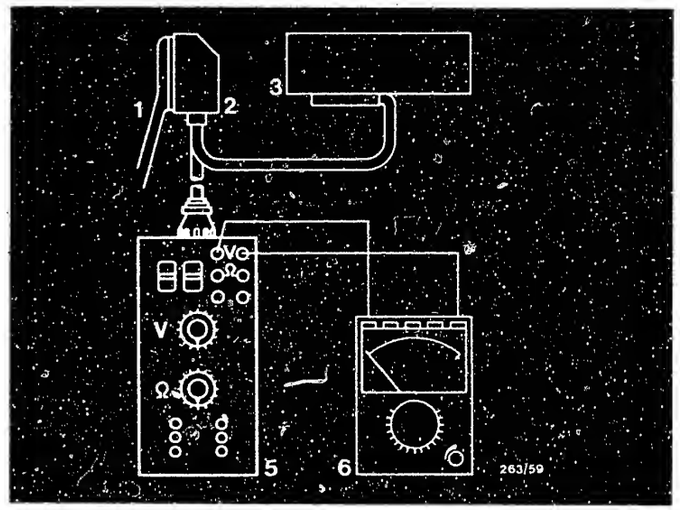
Eliminate open circuit, or replace oil pressure switch.

Oil-pressure switch next to the oil dipstick



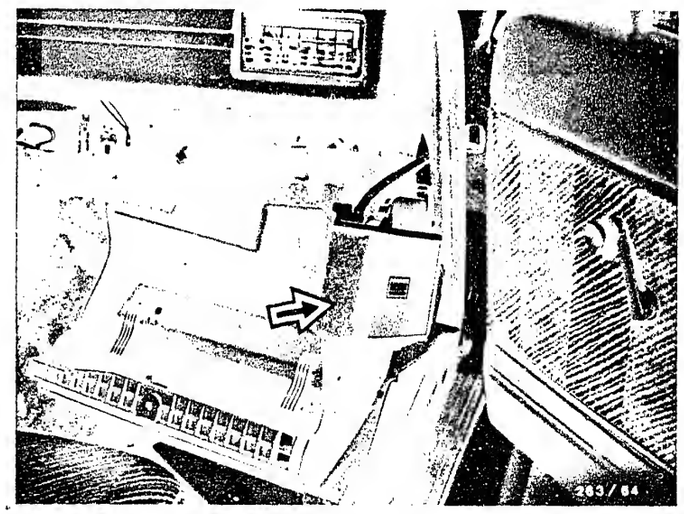
Test step 16

Operation		Reading	Testing
Program switch setting "V"	9	On the multimeter: With engine OFF and air pressure approx. 1 bar 1.3 ... 2.1 V At idle: approx. 0.35 V	Component: Charge-air pressure sensor Pin 16
Program switch setting "Ω"	--		Operation: Measurement of voltage with engine OFF or idle speed
Test equipment: Universal test adapter Multimeter			
Range of measurement: 0 ... 5 V			Malfunction: At 0 V or > 2 V
Connection: Red test socket = + Blue test socket = -			
Operation in vehicle: Ignition ON			
Additional operation: 1. Engine OFF 2. Engine runs at idle			



1 = 35-pole connector to the vehicle wiring harness
2 = Adapter lead
3 = Instrument cluster
4 = Universal test adapter
5 = Multimeter

Control unit for ignition control (arrow)



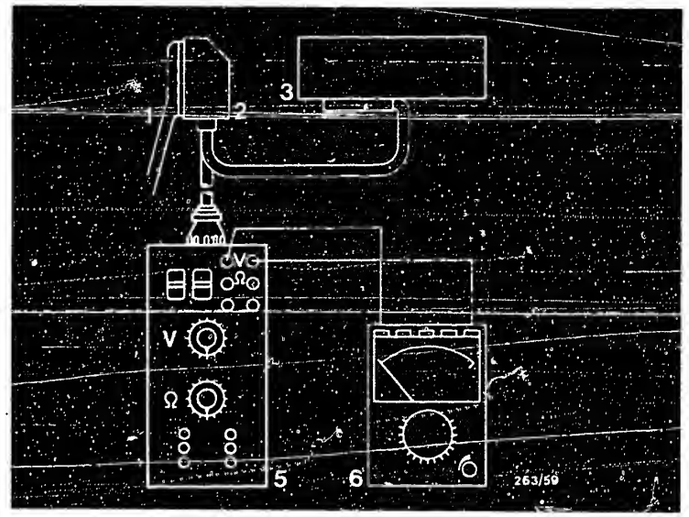
Possible defects:

The lead has a short-circuit or a break. Plugs do not make contact - there is a break at Pin 16 on the instrument cluster.
Charge-air pressure sensor is defective.

Note:
The charge-air pressure sensor is integrated into the ignition control unit (Hitachi). This instrument is located on the right next to the glove compartment (see Figure at bottom).

Take out and replace a defective connecting lead or charge-air pressure sensor (control unit for the ignition control)

Test step 17			
Operation		Reading	Testing
Program switch setting "V"	10	On the multimeter: 0V→approx.5V→0V or approx.5V→0V→approx.5V	Component: Displacement sensor on the Cardan shaft Pin 30
Program switch setting "Ω"	--		Operation: Measurement of voltage (Pulsing EC voltage)
Test equipment: Universal test adapter Multimeter			Malfunction: At 0 V constant, or 6 V constant
Range of measurement: 0 ... 15 V			
Connection: Red test socket = + Black test socket = -			
Operation in vehicle: Ignition ON			
Additional operation: Move vehicle approx. 1.0 m.			

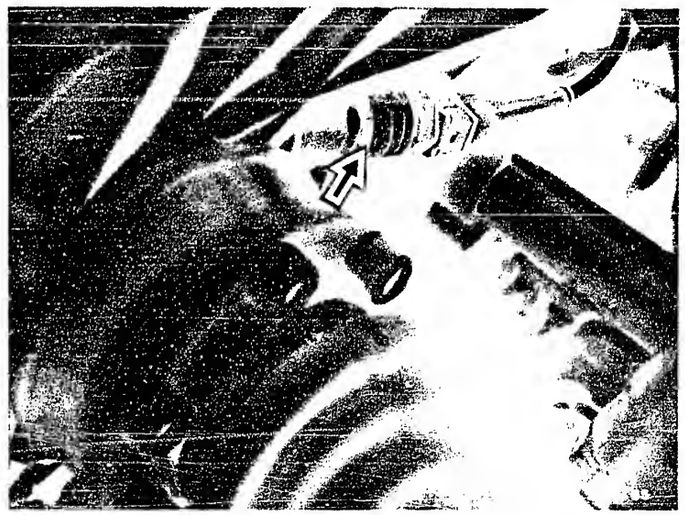


1 = 35-pole connector to the vehicle wiring harness
2 = Adapter lead
3 = Instrument cluster
4 = Universal test adapter
5 = Multimeter

Possible defects:

No connection to Pin 30 on the instrument cluster.
The lead has a short-circuit or a break.
Displacement sensor defective.

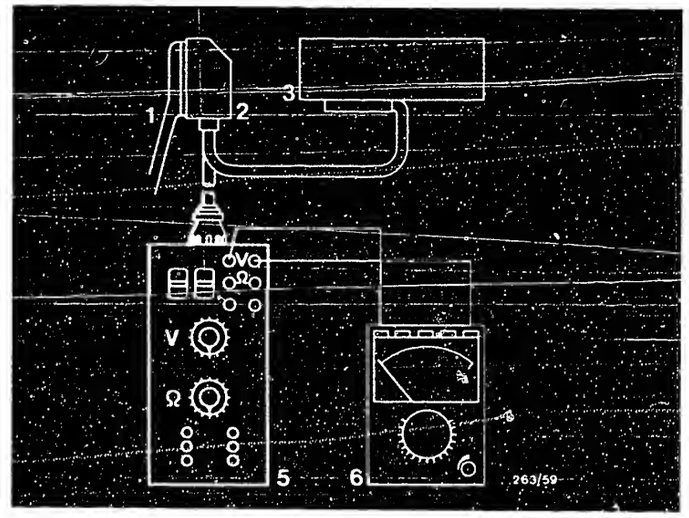
Take out and replace defective leads or displacement sensor.



Displacement sensor (arrow) on the front differential

Test step 18

Operation		Reading	Testing
Program switch setting "V"	11	On the multimeter:	Component: Alternator and charge indicator light Pin 20
Program switch setting "Ω"	—	At fast idle: ≧ 12 V	Operation: Alternator voltage increases to min. 12 V.
Test equipment: Universal test adapter Multimeter		With engine off: 0 V	Malfunction: ≦ 12 V at fast idle.
Range of measurement: 0 ... 15 V			
Connection: Red test socket = + Blue test socket = -			
Operation in vehicle: 1. Start engine, run at fast idle. 2. Shut off engine.			



1 = 35-pole connector to the vehicle wiring harness
2 = Adapter lead
3 = Instrument cluster
4 = Universal test adapter
5 = Multimeter

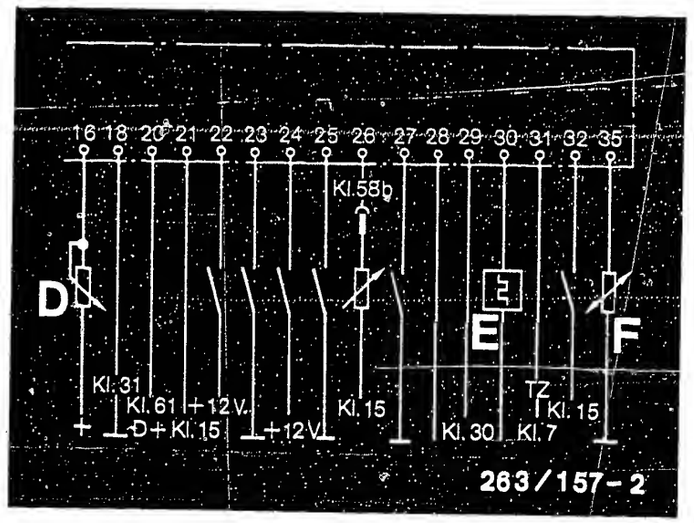
Partial connection diagram for the vehicle wiring harness to the instrument cluster

Possible defects:

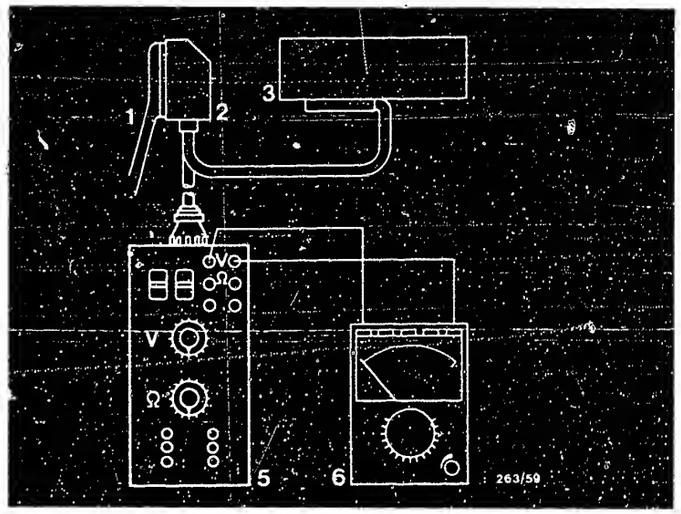
The lead from Term. 61 (Alternator D+) to Pin 20 has a break or a short-circuit.

The charge indicator light (at Pin 20 of the instrument cluster) is defective.

Take out and replace defective leads or charge-indicator light



Test step 19			
Operation		Reading	Testing
Program switch setting "V"	12	On the multimeter: 5 V	Component: Supply voltage for fuel-consumption sensor Pin 19
Program switch setting "Ω"	--		Operation: Measurement of voltage
Test equipment: Universal test adapter Multimeter			Malfunction: With voltage less than or more than 5 V
Range of measurement: 0 ... 5 V			
Connection: Red test socket = + Black test socket = -			
Operation in vehicle: Ignition ON			



1 = 35-pole connector to the vehicle wiring harness
2 = Adapter lead
3 = Instrument cluster
4 = Universal test adapter
5 = Multimeter

Possible defects:

The lead for the supply voltage to the fuel-consumption sensor is not connected to Pin 19 of the instrument cluster. There is a break in the lead.

The instrument cluster is defective. Pin 19 is not being supplied with 5 V.

Take out and replace defective leads.

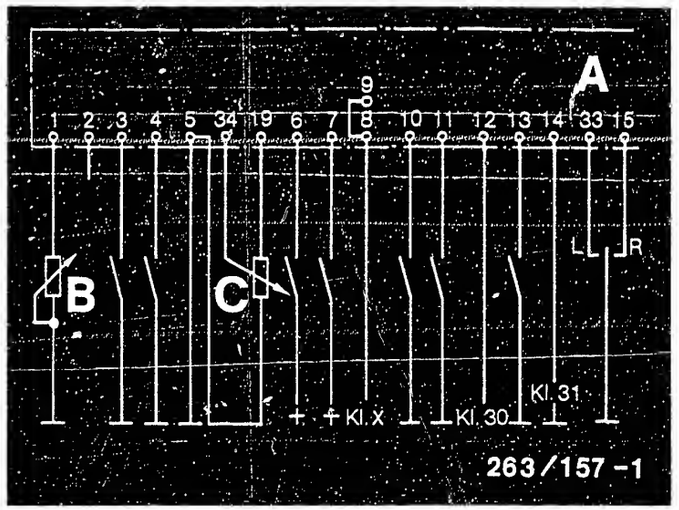
Adjustment of the fuel-consumption sensor.

With the sensor plate in its zero position (i.e., the upper edge of the sensor plate flush with the start of the cone), adjust the fuel-consumption sensor (potentiometer) in such a way that the voltage at the measuring instrument is exactly zero Volts (± 0.05 V).

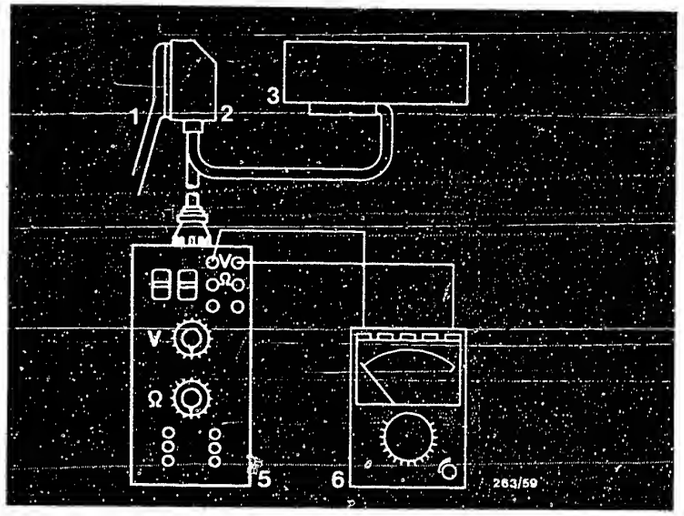
The voltage must increase immediately when the sensor plate is deflected only slightly.

Tighten the fastening screws to a tightening torque of 1.5 ... 2.0 Nm, and secure with locking paint.

Partial connection diagram for the vehicle wiring harness to the instrument cluster



Test step 20			
Operation		Reading	Testing
Program switch setting "V"	13	On the multimeter: 0 - 4.5 V Depending on the engine speed, the voltage at the fuel-consumption sensor fluctuates between 0 and 4.5 V	Component: Measured value of the fuel-consumption sensor Pin 34
Program switch setting "Ω"	--		Operation: Measurement of voltage
Test equipment: Universal test adapter Multimeter			Malfunction: Voltage always 0 V or 5 V Reading for consumption not O.K.
Range of measurement: 0 ... 5 V			
Connection: Red test socket = + Black test socket = -			
Operation in the vehicle: Start the engine			



1 = 35-pole connector to the vehicle wiring harness
2 = Adapter lead
3 = Instrument cluster
4 = Universal test adapter
5 = Multimeter

Possible defects:

The lead to Pin 34 on the instrument cluster is not connected to the fuel-consumption sensor.

Take out and replace a defective lead.

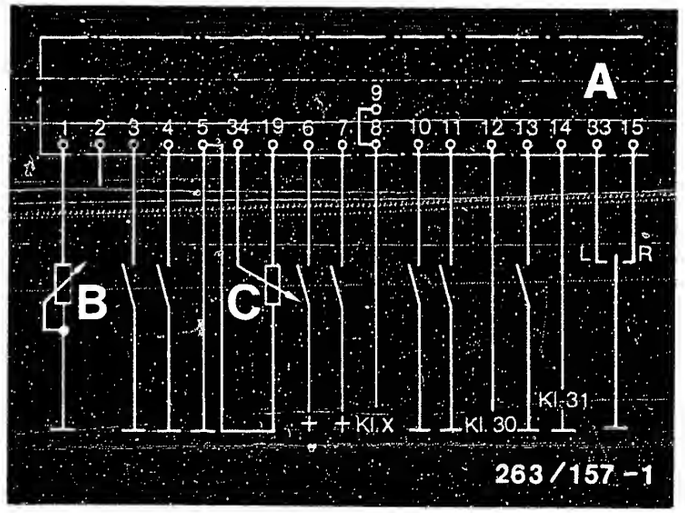
Adjustment of the fuel-consumption sensor.

With the sensor plate in its zero position (i.e., the upper edge of the sensor plate flush with the start of the cone), adjust the fuel-consumption sensor (potentiometer) in such a way that the voltage at the measuring instrument is exactly 0 Volts (± 0.05 V).

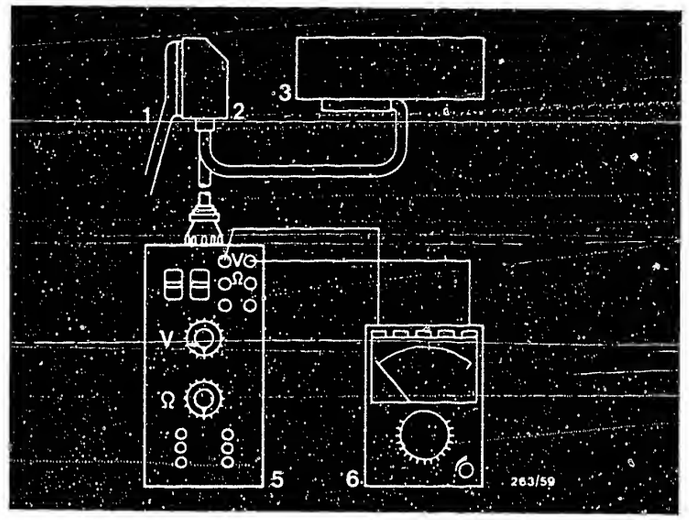
The voltage must increase immediately when the sensor plate is deflected only slightly.

Tighten the fastening screws to a tightening torque of 1.5 ... 2.0 Nm, and secure with locking paint.

Partial connection diagram for the vehicle wiring harness to the instrument cluster



Test step 21			
Operation		Reading	Testing
Program switch setting "V"	14	On the multimeter:	Component: Left-hand rocker button for trip computer Pin 33
Program switch setting "Ω"	--	When the rocker on the left is activated, the voltage goes from approx. 5 V to 0 V	Operation: Measurement of voltage
Test equipment: Universal test adapter Multimeter			Malfunction: If the voltage does not return to 0 V or is always 0 V.
Range of measurement: 0 ... 5 V			
Connection: Red test socket = + Blue test socket = -			
Operation in the vehicle: Ignition ON			
Additional function: Press left-hand rocker button			



1 = 35-pole connector to the vehicle wiring harness
2 = Adapter lead
3 = Instrument cluster
4 = Universal test adapter
5 = Multimeter

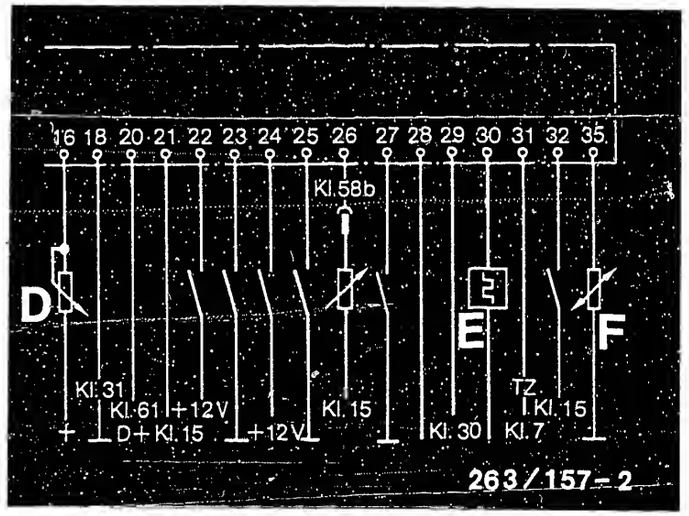
Possible defects:

Open circuit or short circuit to ground in lead from rocker button to ground. - Rocker button defective.
There are no 5 V being applied at Pin 33 of the instrument cluster.

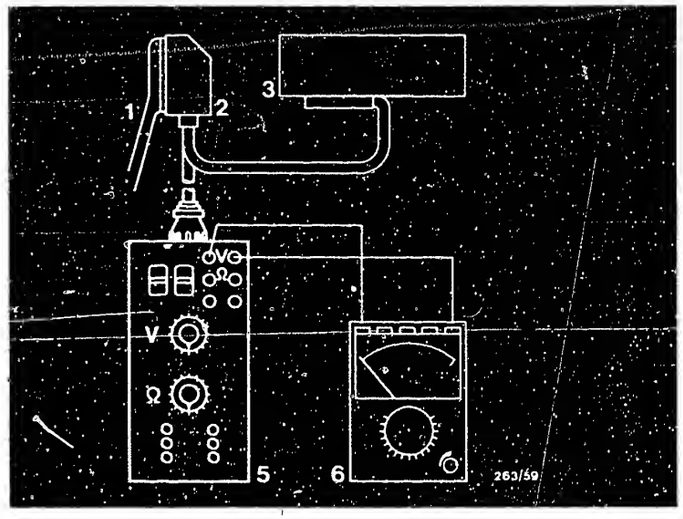
There is a break in the lead from Pin 33 of the instrument cluster to the rocker switch.

Replace defective lead or rocker button.

Partial connection diagram for the vehicle wiring harness to the instrument cluster

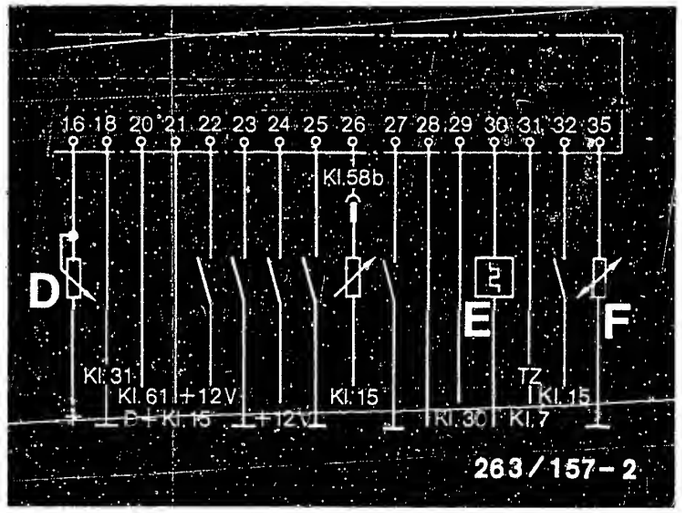


Test step 22			
Operation		Reading	Testing
Program switch setting "V"	15	On the multimeter: When the rocker switch on the right is activated, the voltage goes from approx. 5 V to 0 V	Component: Right-hand rocker button for trip computer. Pin 15
Program switch setting "Ω"	--		
Test equipment: Universal test adapter Multimeter			Operation: Measurement of voltage
Range of measurement: 0 ... 5 V			Malfunction: If the voltage does not return to 0 V or is always 0 V.
Connection: Red test socket = + Black test socket = -			
Operation in the vehicle: Ignition ON			
Additional operation: Press right-hand rocker button			



1 = 35-pole connector to the vehicle wiring harness
2 = Adapter lead
3 = Instrument cluster
4 = Universal test adapter
5 = Multimeter

Partial connection diagram for the vehicle wiring harness to the instrument cluster



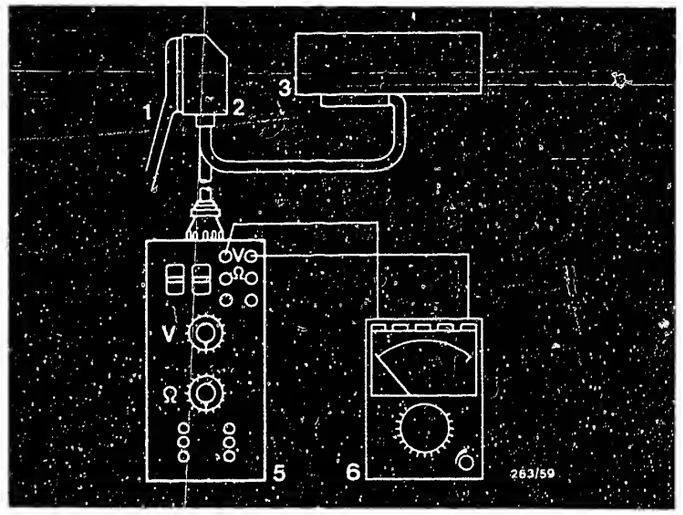
Possible defects:

Open circuit or short circuit to ground in lead from rocker button to ground. - Rocker button defective.
There are no 5 V being applied at Pin 33 of the instrument cluster.

There is a break in the lead from Pin 15 of the instrument cluster to the rocker switch.

Replace defective lead or rocker button.

Test step 23			
Operation		Reading	Testing
Program switch setting "V"	16	On the multimeter:	Component: Reset button Pin 13
Program switch setting "Ω"	--	When the reset button is activated, the voltage returns from	Operation: Measurement of voltage
Test equipment: Universal test adapter Multimeter		approx. 12 V to 0 V.	Malfunction: If the voltage does not return to 0 V or is always 0 V.
Range of measurement: 0 ... 5 V			
Connection: Red test socket = + Black test socket = -			
Operation in the vehicle: Ignition ON			
Additional operation: Press reset button			



1 = 35-pole connector to the vehicle wiring harness
2 = Adapter lead
3 = Instrument cluster
4 = Universal test adapter
5 = Multimeter

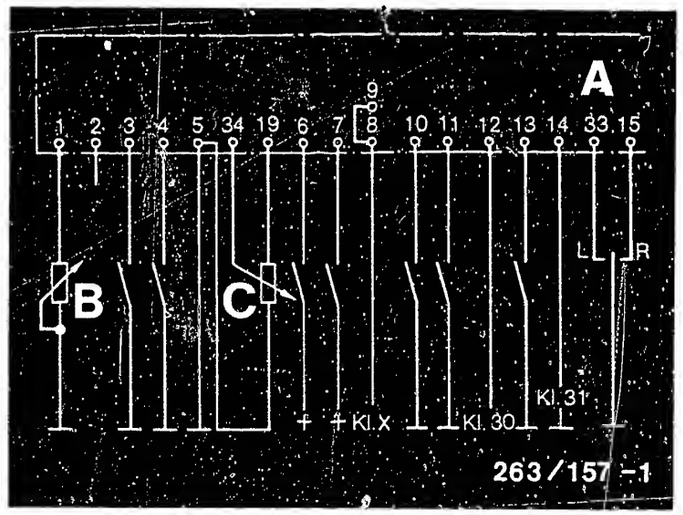
Partial connection diagram for the vehicle wiring harness to the instrument cluster

Possible defects:

There is a break in the lead from the reset button to ground.
The reset button is defective.
There are no 5 V being applied at Pin 13 of the instrument cluster.

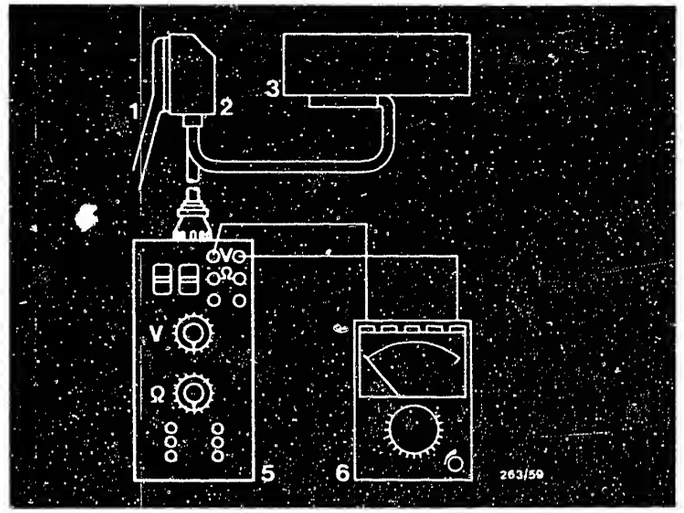
The lead from Pin 13 of the instrument cluster to the reset button has a break.

Take out and replace a defective lead or reset button.



Test step 24

Operation		Reading	Testing
Program switch setting "V"	17	On the multimeter: When reduced-display button is pressed, voltage rises from 0 V to 12 V.	Component: Button for reduced-display Pin 32
Program switch setting "Ω"	--		Operation: Measurement of voltage
Test equipment: Universal test adapter Multimeter			Malfunction: If the voltage does not rise to $V_{battery}$
Range of measurement: 0 ... 15 V			
Connection: Red test socket = + Black test socket = -			
Operation in the vehicle: Ignition ON			
Additional operation: Press reduced-display button			



1 = 35-pole connector to the vehicle wiring harness
2 = Adapter lead
3 = Instrument cluster
4 = Universal test adapter
5 = Multimeter

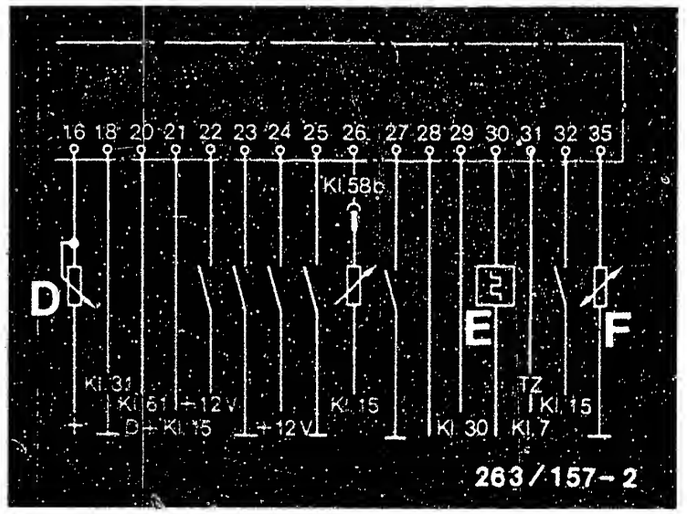
Partial connection diagram for the vehicle wiring harness to the instrument cluster

Possible defects:

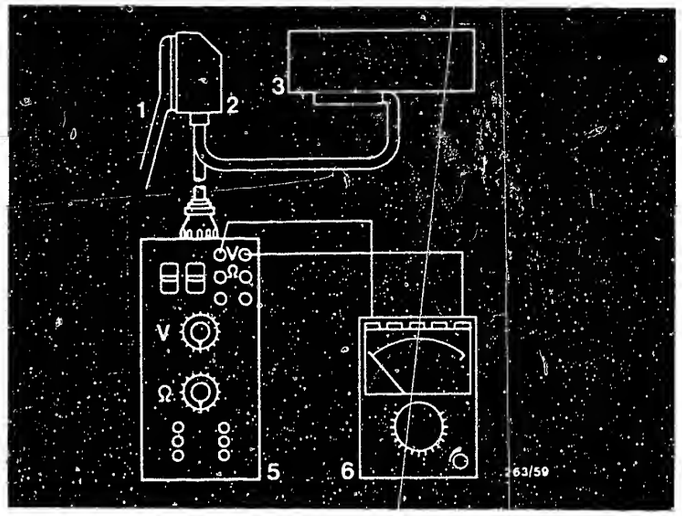
The lead from the button for reduced display to Pin 15 has a break.
Button is defective.

The lead from Pin 32 of the instrument cluster to the button for reduced display has a break.

Take out and replace defective leads or button for reduced display.

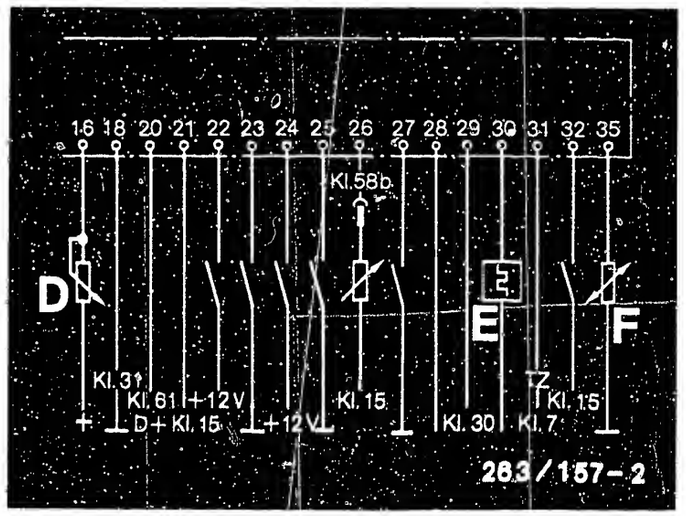


Test step 25			
Operation		Reading	Testing
Program switch setting "V"	18	On the multimeter: approx. 12 V	Component: Indicator light for rear fog warning light Pin 24
Program switch setting "Ω"	--		Operation: Measurement of voltage
Test equipment: Universal test adapter Multimeter			Malfunction: At 0 V
Range of measurement: 0 ... 15 V			
Connection: Red test socket = + Black test socket = -			
Operation in the vehicle: Switch on driving lights			
Additional operation: Switch on rear fog warning light.			



1 = 35-pole connector to the vehicle wiring harness
2 = Adapter lead
3 = Instrument cluster
4 = Universal test adapter
5 = Multimeter

Partial connection diagram for the vehicle wiring harness to the instrument cluster



Possible defects:

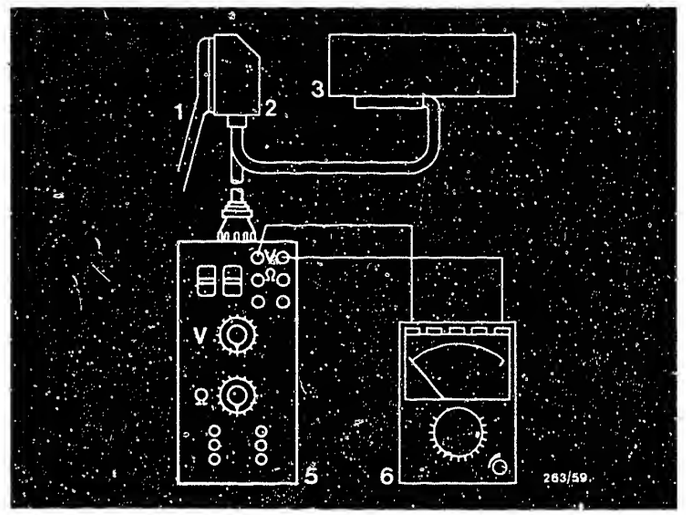
The lead from the switch for the rear fog warning light to Pin 24 of the instrument cluster has a break or short-circuit.

The indicator light in the instrument cluster is defective.

Take out and replace a defective lead or indicator light in the instrument cluster.

Test step 26

Operation		Reading	Testing
Program switch setting "V"	19	On the multimeter:	Component: Indicator light for the hazard-warning flasher Pin 6
Program switch setting "Ω"	--	12 V	Operation: Measurement of voltage
Test equipment: Universal test adapter Multimeter			Malfunction: At 0 V
Range of measurement: 0 ... 15 V			
Connection: Red test socket = + Black test socket = -			
Operation in the vehicle: Switch on the hazard-warning system			



1 = 35-pole connector to the vehicle wiring harness
2 = Adapter lead
3 = Instrument cluster
4 = Universal test adapter
5 = Multimeter

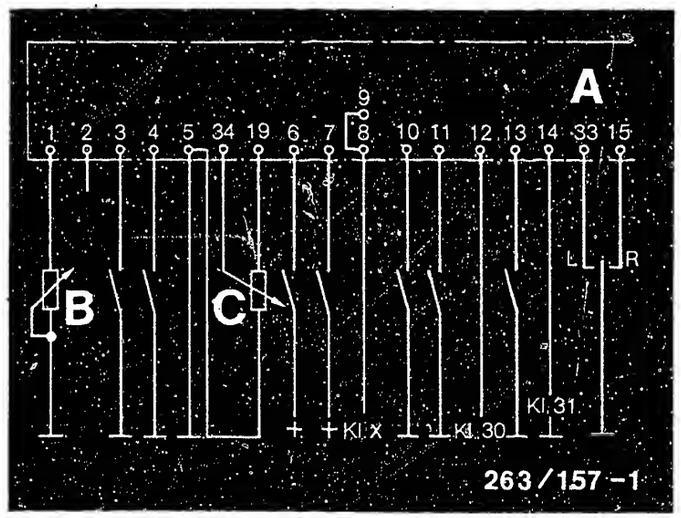
Partial connection diagram for the vehicle wiring harness to the instrument cluster

Possible defects:

The lead from the hazard-warning flasher to Pin 6 on the instrument cluster has a break/short-circuit.

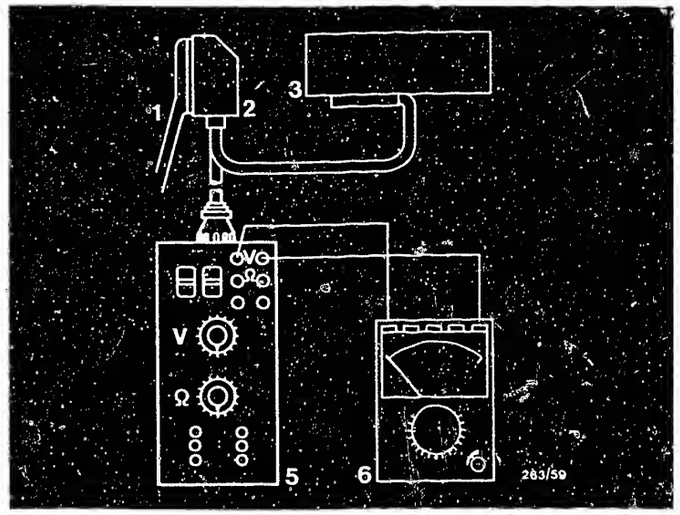
The indicator light for the hazard-warning flasher is defective.

Take out and replace defective leads or indicator light for the hazard-warning flasher.



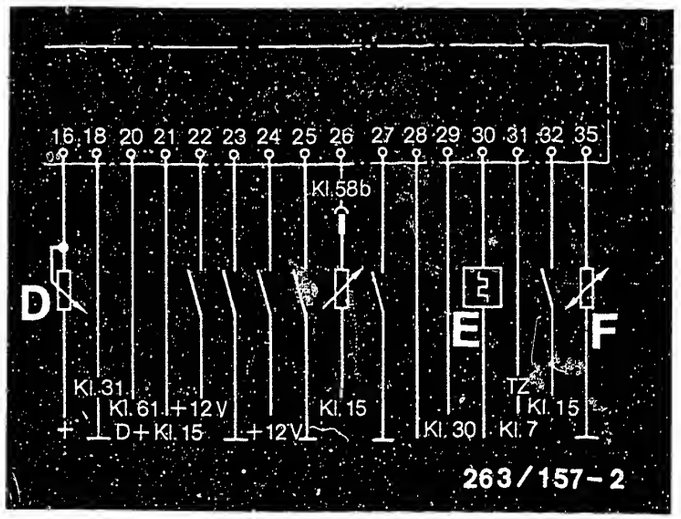
Test step 27

Operation		Reading	Testing
Program switch setting "V"	20	On the multimeter: approx. 12 V	Component: Indicator light for the heated rear window Pin 22
Program switch setting "Ω"	--		Operation: Measurement of voltage
Test equipment: Universal test adapter Multimeter			Malfunction: At 0 V
Range of measurement: 0 ... 15 V			
Connection: Red test socket = + Black test socket = -			
Operation in the vehicle: Switch on the heated rear window			



1 = 35-pole connector to the vehicle wiring harness
2 = Adapter lead
3 = Instrument cluster
4 = Universal test adapter
5 = Multimeter

Partial connection diagram for the vehicle wiring harness to the instrument cluster



Possible defects:

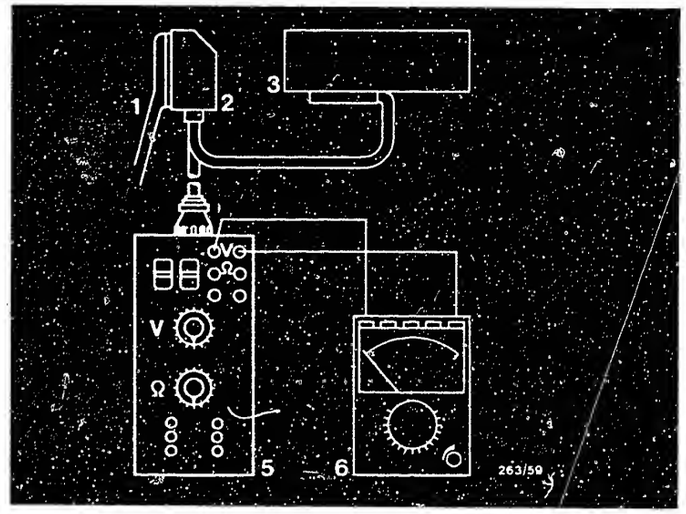
The lead from the switch for the heated rear window to Pin 22 of the instrument cluster has a break or short-circuit.

The indicator light for the heated rear window is defective.

Take out and replace defective leads or indicator light for the heated rear window.

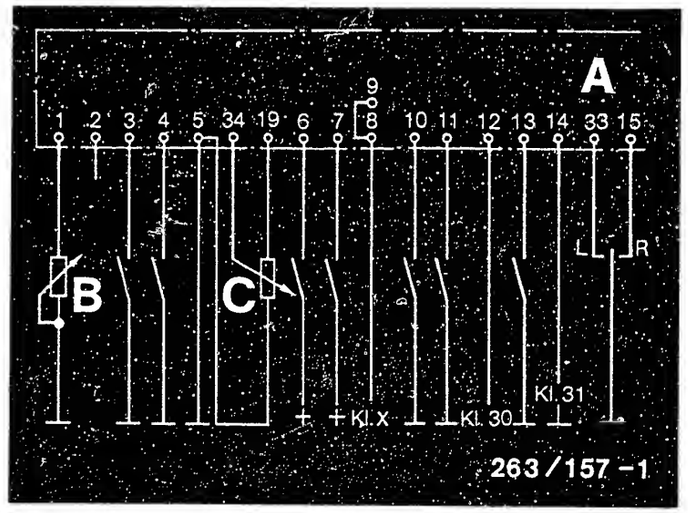
Test step 28

Operation		Reading	Testing
Program switch setting "V"	21	On the multimeter: approx. 12 V	Component: Indicator light for high beam Pin 7
Program switch setting "Ω"	--		Operation: Measurement of voltage
Test equipment: Universal test adapter Multimeter			Malfunction: At 0 V
Range of measurement: 0 ... 15 V			
Connection: Red test socket = + Black test socket = -			
Operation in the vehicle: Switch on ignition.			
Additional operation: Switch on high beam light			



1 = 35-pole connector to the vehicle wiring harness
2 = Adapter lead
3 = Instrument cluster
4 = Universal test adapter
5 = Multimeter

Partial connection diagram for the vehicle wiring harness to the instrument cluster



Possible defects:

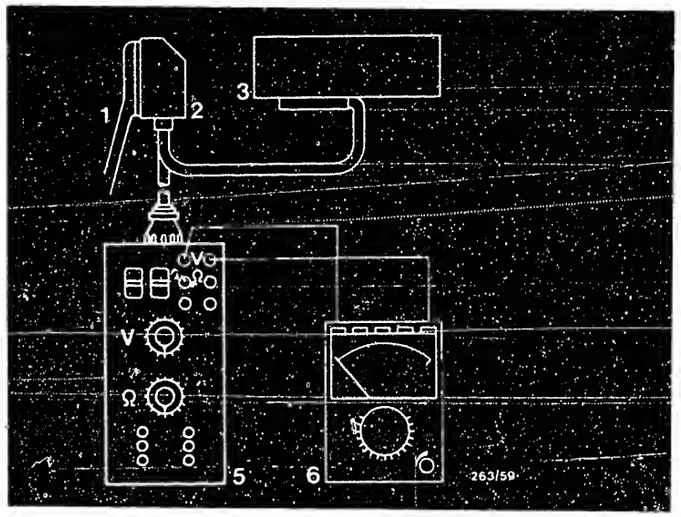
The lead from the high beam switch to Pin 7 on the instrument cluster has a break or short-circuit.

The indicator light for high beam light is defective.

Take out and replace defective leads or high beam indicator light.

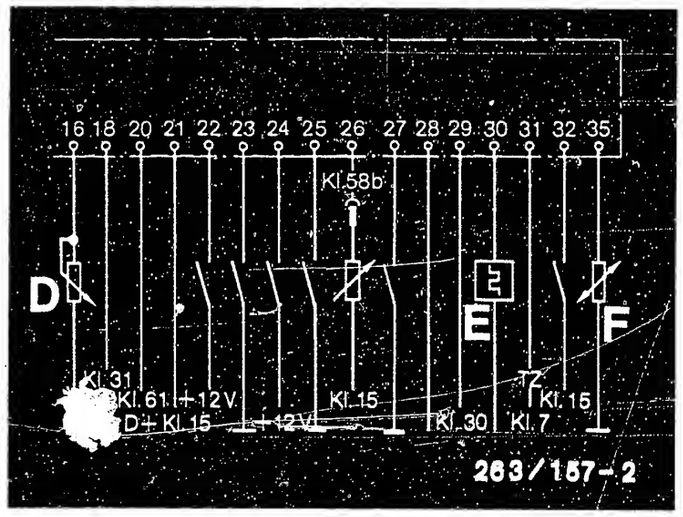
Test step 29

Operation		Reading	Testing
Program switch setting "V"	22	On the multimeter:	Component: Indicator for turn-signal Pin 23
Program switch setting "Ω"	--	approx. 12 V	
Test equipment: Universal test adapter Multimeter		(in rhythm with the flashing frequency)	Operation: Measurement of voltage
Range of measurement: 0 ... 15 V			Malfunction: Constant at 0 V or 12 V
Connection: Red test socket = + Black test socket = -			
Operation in the vehicle: Ignition ON			
Additional operation: Activate the turn-signal			



1 = 35-pole connector to the vehicle wiring harness
2 = Adapter lead
3 = Instrument cluster
4 = Universal test adapter
5 = Multimeter

Partial connection diagram for the vehicle wiring harness to the instrument cluster



Possible defects:

The lead from the turn-signal relay to Pin 23 of the instrument cluster has a break or short-circuit.

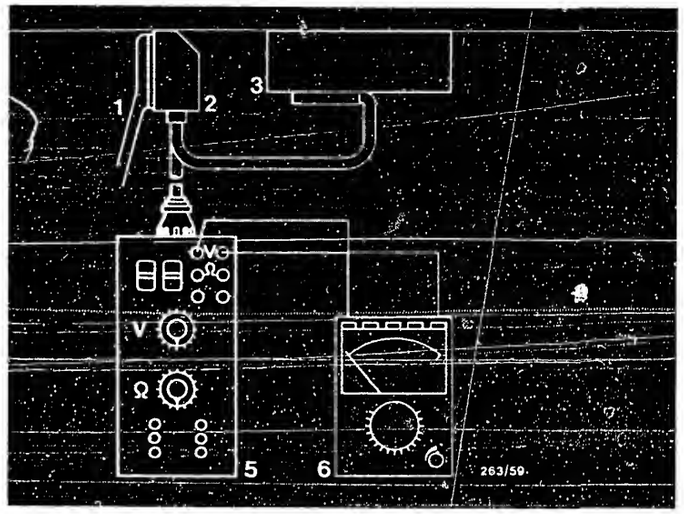
The indicator light for the turn-signal is defective.
The turn-signal flasher is defective.

Note:
The turn-signal flasher is fastened by means of a spring to a bracket on the back of the instrument cluster.

Take out and replace defective leads, turn-signal indicator light, and/or turn-signal flasher.

Test step 30

Operation		Reading	Testing
Program switch setting "V"	23	On the multimeter: 6 - 12 V	The display brightness control on the instrument cluster Pin 26
Program switch setting "Ω"	--		
Test equipment: Universal test adapter Multimeter			Operation: Measurement of voltage
Range of measurement: 0 ... 15 V			
Connection: Red test socket = + Black test socket = -			Malfunction: If the voltage does not change.
Operation in the vehicle: Activate brightness control			



1 = 35-pole connector to the vehicle wiring harness
2 = Adapter lead
3 = Instrument cluster
4 = Universal test adapter
5 = Multimeter

Partial connection diagram for the vehicle wiring harness to the instrument cluster

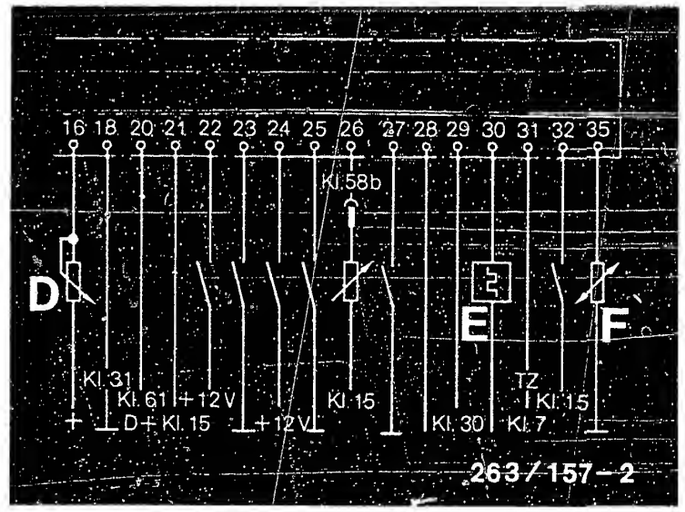
Possible defects:

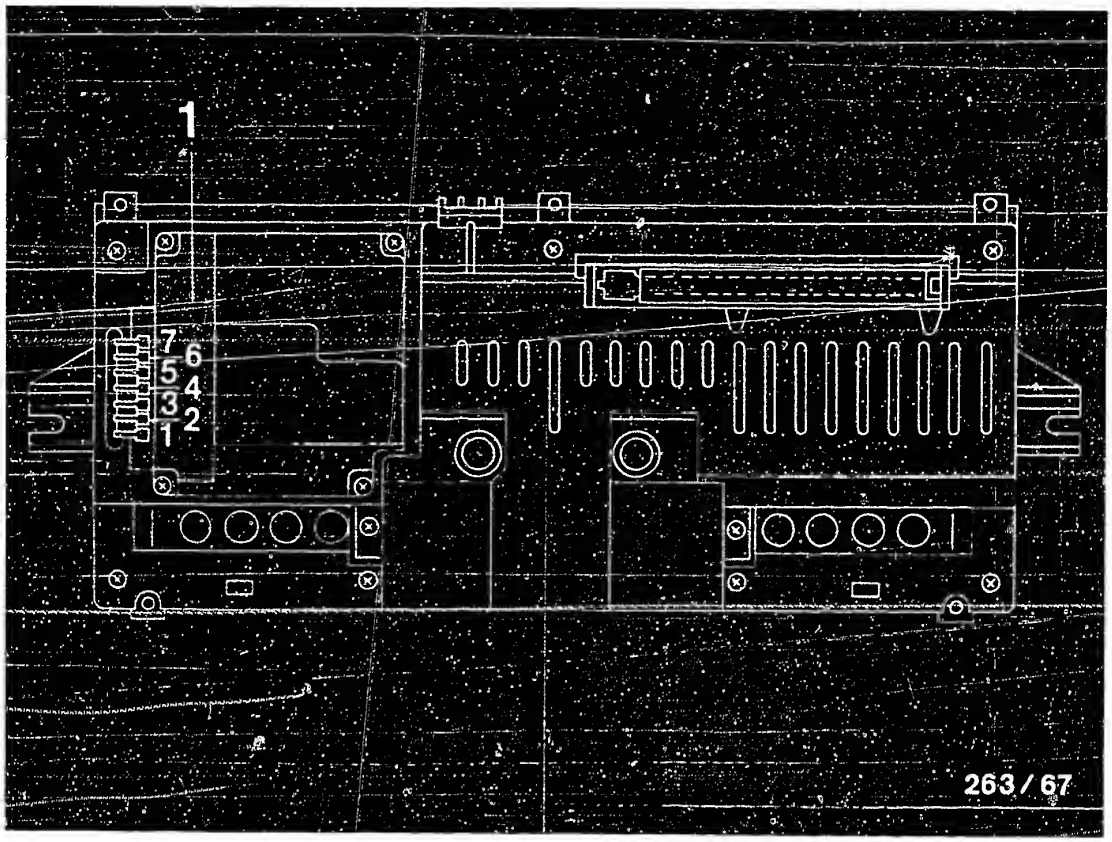
The lead from the display brightness control (Term. 58b) to Pin 26 on the instrument cluster has a break or a short-circuit.

The display brightness control is defective.

The instrument cluster is defective.

Take out and replace a defective lead, display brightness control, or instrument cluster.

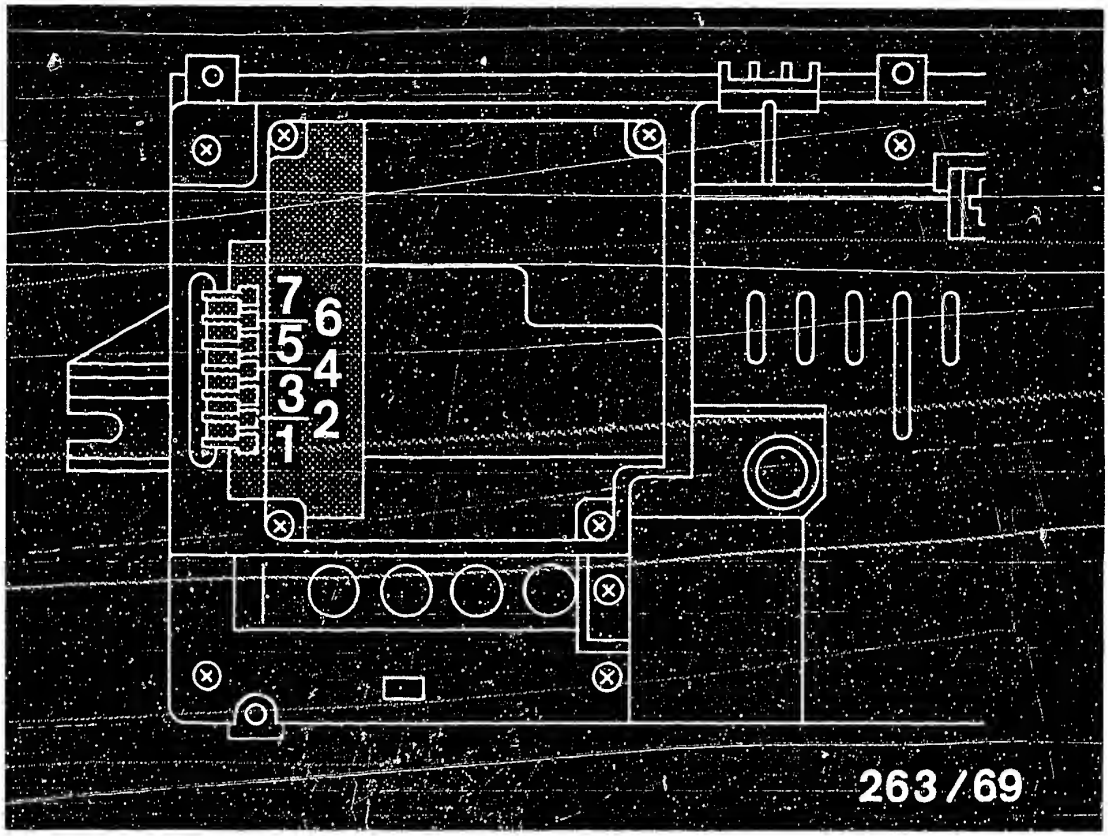




1 = Voltage transformer on the instrument cluster (back)

9. Checking the voltage transformer

If the instrument cluster does not light after "ignition on", the voltage transformer can be defective.
If a voltage value is not obtained on the transformer, replace voltage transformer.
To do this, take out the instrument cluster. Do not separate it from the vehicle wiring harness.
Turn the instrument cluster in such a way that measurements can be taken on the voltage transformer.
Release the fastening screws for the voltage transformer somewhat, and pull out the cover sheet (if there is one).
Retighten the fastening screws.
Be certain to do the measurements in the proper order.



1 = V_D 3 = Term.31 5 = F 7 = V_k
2 = Term.15 4 = V_v 6 = F

Sequence of measurements on the voltage transformer

1. V_v = 5 V, measured to Term. 31 (ground)

(The voltage U_v is generated in the voltage transformer. The instrument cluster is supplied with this voltage.) If the test specification is not obtained on the voltage transformer, the voltage transformer is defective.

2. U_k = 26 ... 29 V measured against U_v.

3. U_D = 11 V measured against term. 31.

4. F measured against F' = 3 - 4 V (AC voltage)

Caution: Do not jump F and F' during measurement, since the voltage transformer is destroyed immediately if that is done.

10. Checking the speech synthesizer module

(Not applicable to all vehicles)

Pull on the handbrake lightly.

Start the engine, and, with the handbrake pulled lightly, drive approx. 3 m.

The following message must now be given by the speech synthesizer module:

"Caution! Release handbrake."

At the same time, the warning light must come on (switched on by the speech synthesizer module).

11. Adjusting the fuel gauge display, with instrument cluster taken out

If the fuel gauge sensor or the fuel tank has been taken out and replaced, the fuel gauge display must be re-adjusted.

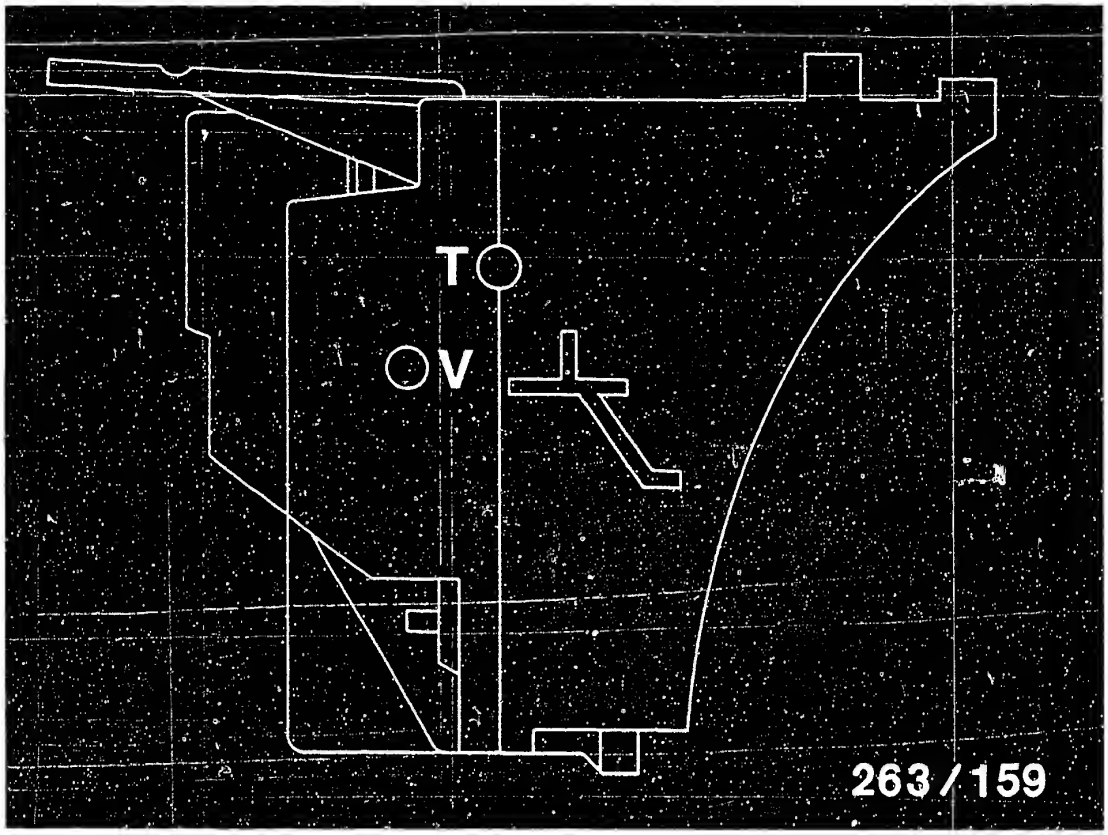
- When working on the fuel system, follow accident prevention regulations and environmental and health regulations.

1. Replace the + connection to the electric fuel pump with a provisional lead.
   Disconnect the fuel hose from the fuel pump, put on a separate hose, and direct it into a fuel canister.
   Connect the provisional electrical lead to the battery.
   The fuel tank is pumped dry.

2. Put exactly 10 l into the fuel tank.

3. Calibration procedure (possible only in dimension L):
Ignition "OFF".
Press reset button, thereby switching on ignition.
Engine not running.

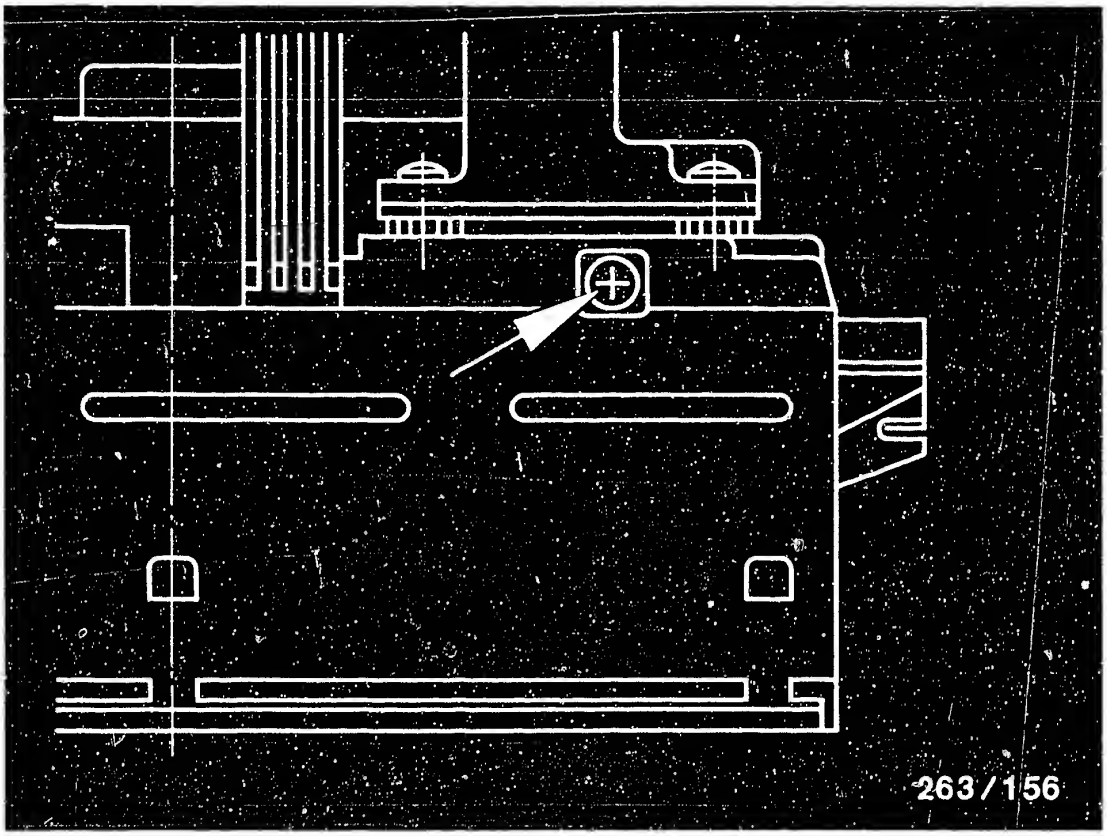
The fuel gauge damping is now switched off and the display can be calibrated to 7 l.



Adjusting the fuel gauge display (continued)

3. Using screwdriver, turn the removed instrument cluster potentiometer "T" (see picture) so that the tank display shows precisely 7 l.

Calibration procedure is terminated with ignition "OFF" or by starting the engine.
During calibration, variant-specific code numbers appear in the display fields for trip computer and speedometer.



Encoding of variants

The various vehicle models have different data for revolutions/distance number, tank characteristic, engine.

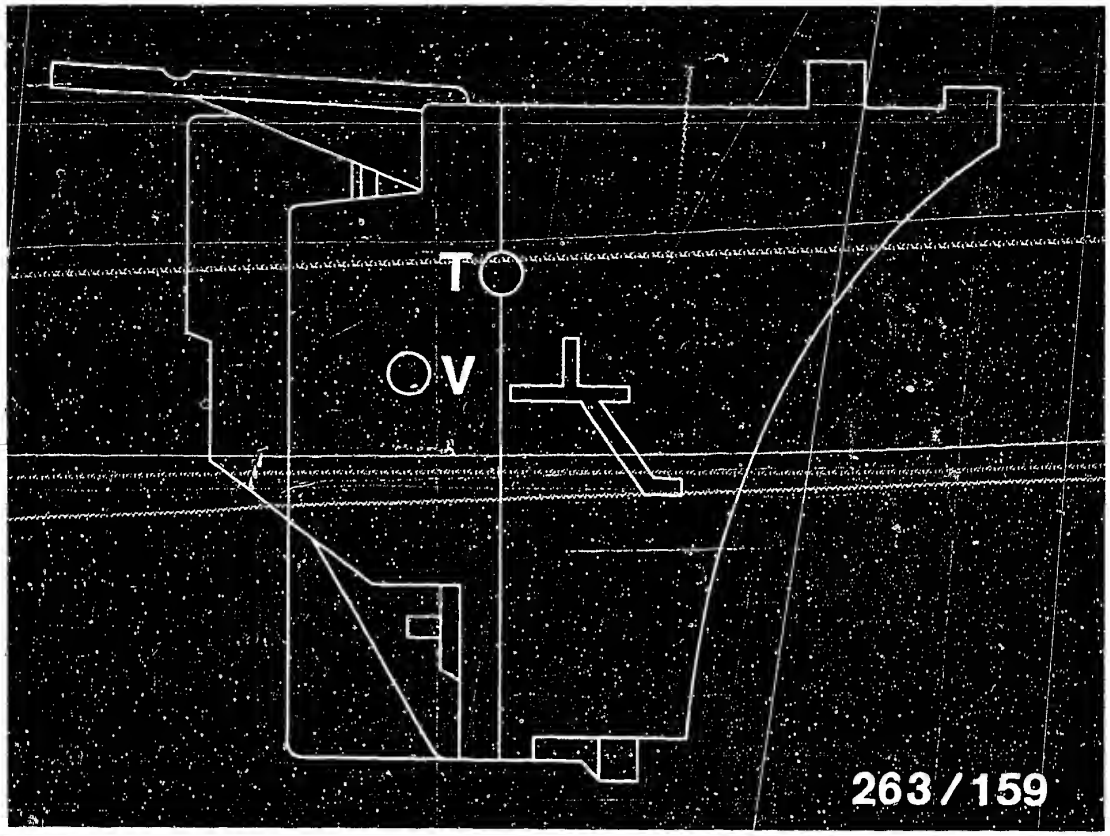
The vehicle models can be set with a code switch (see picture, arrow).

Testing the code switch

The code can only be called up in "calibrate tank" mode (only in dimension L).

Procedure: Ignition "OFF"
Press reset button, thereby switching on the ignition.

Code switch setting	Code display in field trip comp.	speedo	Vehicle	Engine	Version
1	01	01	Quattro	200 HP	EU
1	E01	01	Quattro	200 HP	UK
2	02	02	Coupé/Audi 90	136 Hp	EU
3	03	03	Coupé Q/Audi 90 Q	136 HP	EU
4	04	03	Audi 90 Q 160 HP	160 HP	EU

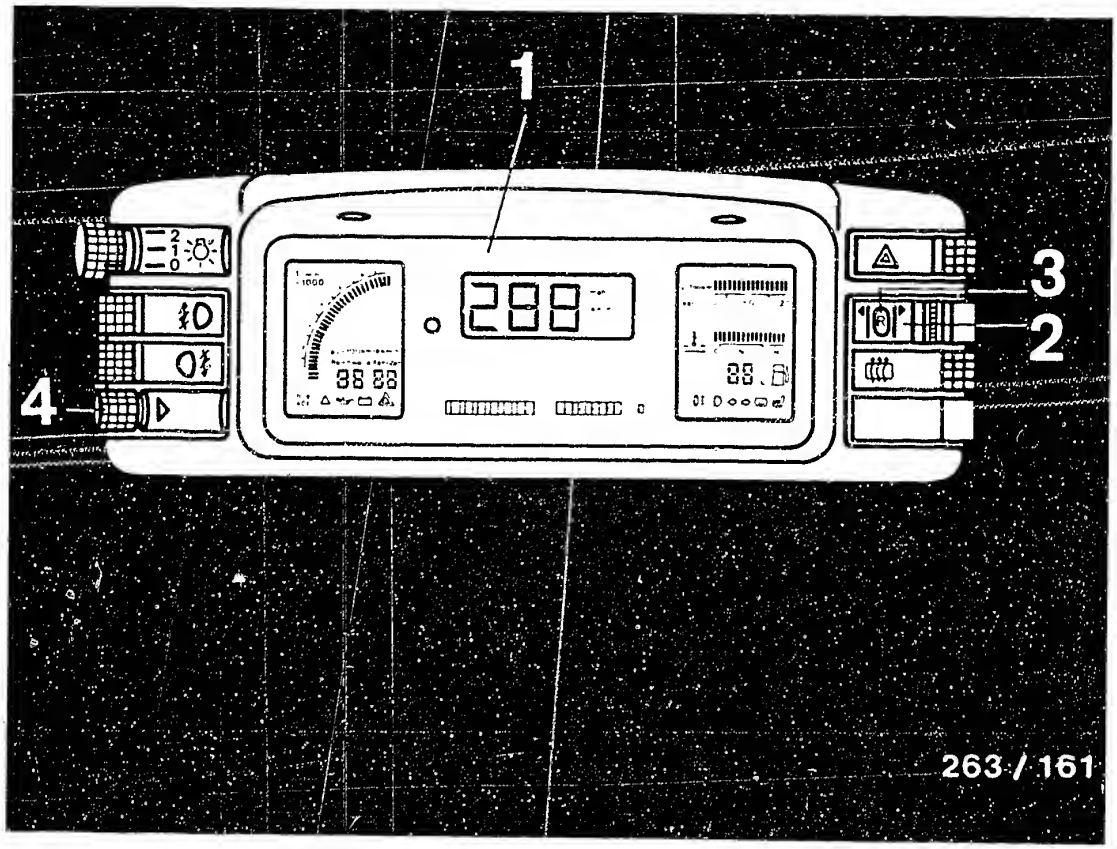


T = Tank correction V = Consumption correction

12. Adjusting the consumption display (ave 1/100 km)

In the case of customer complaints concerning incorrect fuel consumption display - e.g. 10% too much - the fuel consumption display can be re-adjusted:

Press reduced-display button in "calibrate tank" mode. The right-hand trip computer field shows a 2-digit number. Depending on the desired correction, it is now possible by means of potentiometer V (see picture) to adjust the consumption within ± 15%.
From 0 to -15% a minus sign appears.
From 0 to +15% only the % figure appears in the display.



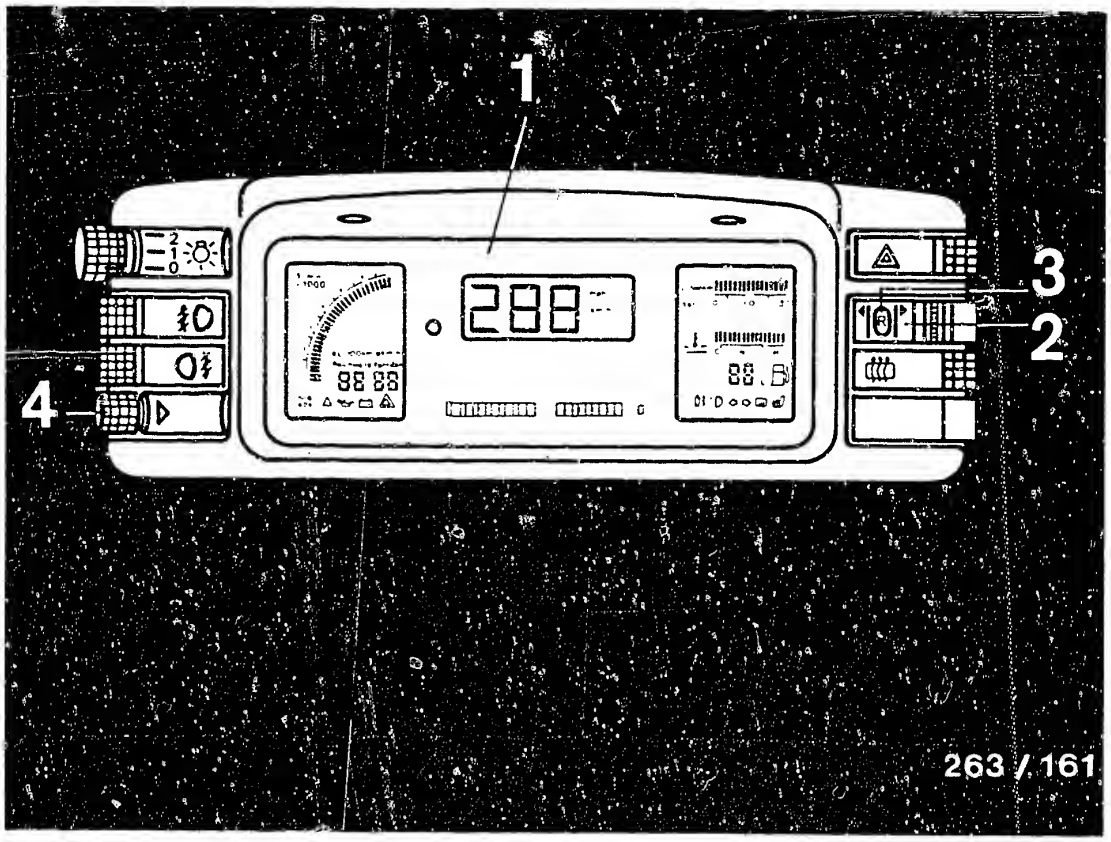
13. Setting the time of day

Select time of day with rocker switch for trip computer. Press right-hand rocker button for approx. 3 sec until hours flash.

Now set hours with reset button.

Each time the reset button is briefly pressed, the hours increase by 1.

If pressed continuously, the hours increase at a rate of 1 Hz.



Setting the minutes:

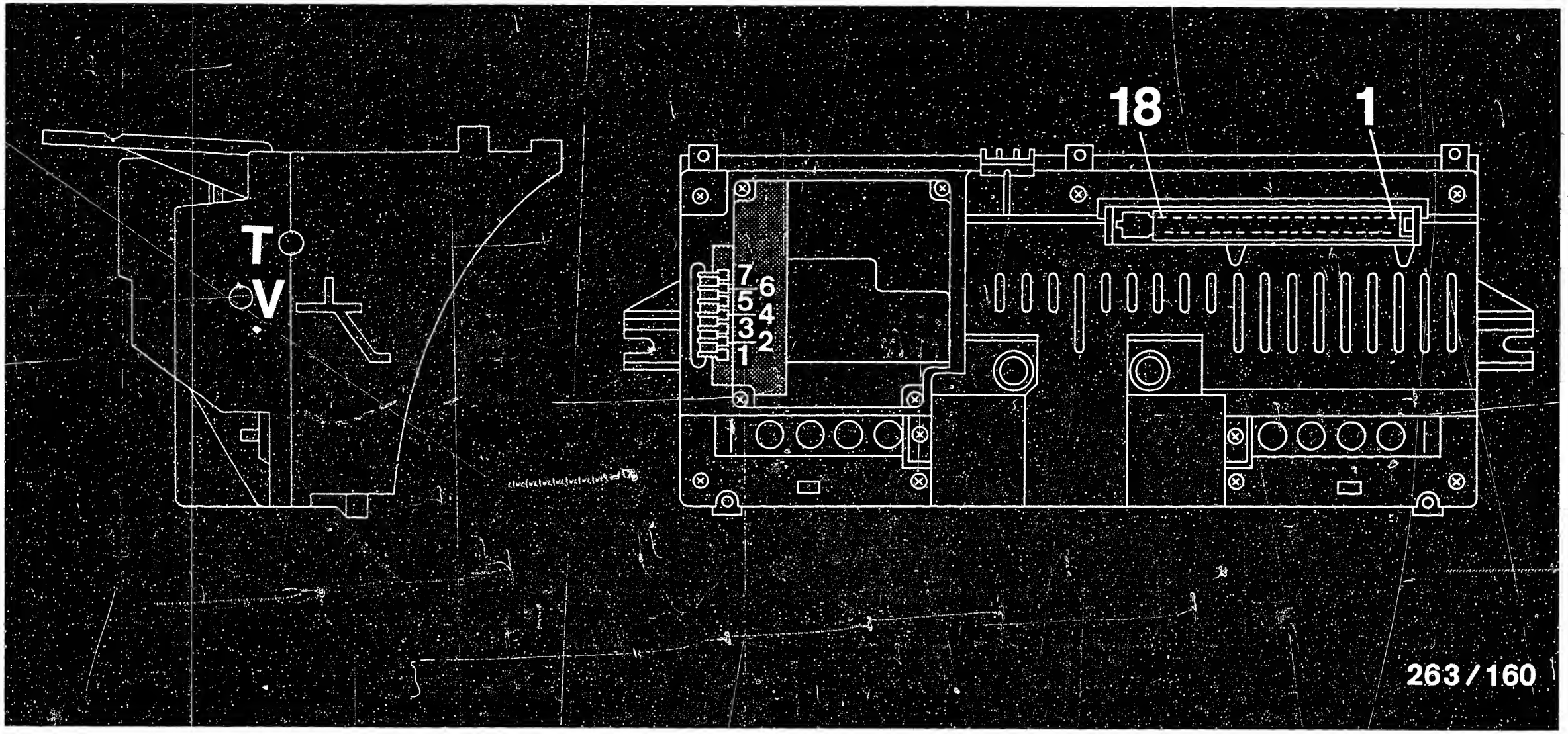
Starting from the hours setting, press right-hand rocker switch for approx. 0.5 sec until the minutes flash. Using the reset button, set the minutes. Each time the reset button is briefly pressed, the minutes increase by 1. If pressed continuously, they increase at a rate of 1 Hz. Set 1 minute less than the desired time. Wait for time signal, and then press reset button. Minutes are increased by 1, seconds start at zero. Press rocker button 2 x on left. Time is displayed. Setting is completed. Flashing dots indicate that clock is working.

14. Checking the changeover from miles - kilometres (Version 0 263 220 011/012 only)

Trip computer must be at time-of-day setting.

Press reset button (≥ 2 sec) until kilometres are indicated on instrument cluster instead of miles.

Pressing again causes change-back to miles.



15. Notes on taking out and replacing an instrument cluster

1. Setting the consumption display on the new instrument cluster: measure the resistance on the old instrument cluster between pins 2 and 18 (ground). Set that value on the new instrument cluster using potentiometer "V". After adjustment, cover up potentiometer "V" once again.
2. Adjusting the fuel gauge display on the new instrument cluster: take reading for fuel level with the old instrument cluster connected and the ignition switched on. After connecting the new instrument cluster, set the value read (on the old instrument cluster) on the new instrument cluster, using potentiometer "T".

   OR: Measure the resistance on the old instrument cluster between pins 1 and 18 (ground) and set that value on the new instrument cluster using potentiometer "T".

After-sales Service

Motor Vehicle Service Information

DANGERS FOR ELECTRONIC EQUIPMENT
WHEN FAST-CHARGERS ARE USED

VDT-I-Gen. 040 En
7.1981

The results of recent investigations have led us to point out that damage to electrical components in the vehicle cannot be excluded when batteries are fast-charged or when starting-aids are used.
In particular, the control units for Motronic and ABS and the trigger boxes of transistorized ignition systems are most subjected to this danger.

To avoid damage to electrical apparatus the following instructions must be followed at all costs:

1. Do not use a fast-charger for starting the engine.
   Starting aids should only be carried out with a second 12 V battery and a starting aid cable.

   Please note: On account of the non-uniform demands placed by vehicle manufacturers on electronic products, we recommend that 24 V batteries are not to be used as a starting aid. Follow the operating instructions with the vehicle.

2. Disconnect the battery from the vehicle electrical system before fast-charging.

3. Never disconnect the battery from the vehicle electrical system with the engine running.

4. After fast-charging, tighten properly the terminals on the terminal posts of the battery.

5. When the battery is charged in the vehicle or when starting aids are used, follow the instructions with the fast-charger as well as the instructions of the vehicle manufacturer.

The main cause of the damage to electrical components are high-energy voltage peaks which are brought about by switching procedures and by unintentionally incorrect operation.
The danger increases with an increasingly sulphated battery, since the attenuating effect of the battery decreases.

BOSCH
Geschäftsbereich KH, Kundendienst, Kfz-Ausrüstung
by Robert Bosch GmbH, D-7 Stuttgart 1, Postfach 50. Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

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Automotive Equipment - After-Sales Service
Department for Technical Publications KH/VDT
Postfach 50, D-7000 Stuttgart 1.

Published by: After-Sales Service Department for Training and Technology (KH/VSK). Press date: 2.1985.